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Electrical Review

Vol. 74. No. 10. CHICAGO, MARCH 8, 1919 Three Dollars a Year

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67 KW-hr. Additional Plant Capacity.

Let's assume that you put on a campaign and install 100 Hughes Electric Ranges. It gives you a gross revenue of $4500, or a total annual consumption of approximately 150,000 KW-hr.

These 100 ranges will show an average connected load of 4 KW.

Allowing for a demand factor of six to one you will see that you can add 400 KW. to your connected load while only calling for 67 KW. of additional plant capacity.

That is the answer.

That is the reason the Hughes Electric Range offers a practical solution from an engineering standpoint.

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EDISON ELECTRIC APPLIANCE CO., Inc.
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New York Ontario, Cal. Atlanta

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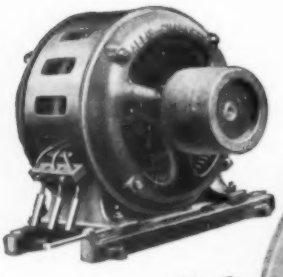
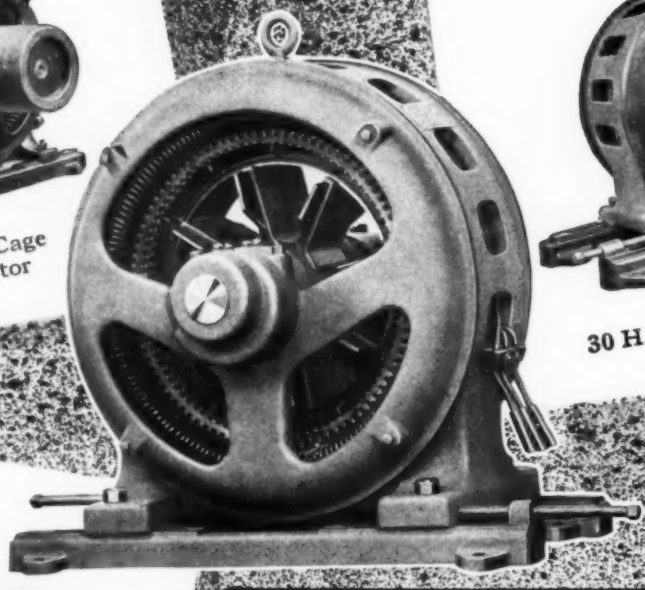
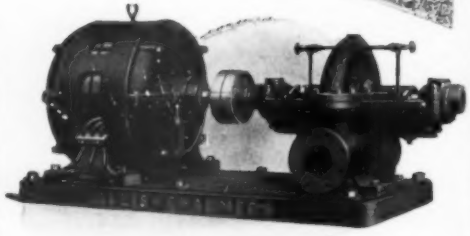


Small Squirrel Cage Induction Motor



30 H. P. Slip Ring Motor

Back Geared Induction Motor —with Gear Case



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Electrical Review
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VOL. 74.—No. 10. CHICAGO, SATURDAY, MARCH 8, 1919. PAGE 371.

Description of Modern Wiring Installation in New Theater

Lighting and Power Installations in People's Theater, Chicago—Major Remote-Control Dead-Front Switchboard—Automatic Fire-Pump Control—Heating and Ventilating Systems—Other Features

THE People's Theater, recently completed in Chicago, contains many features typical of the more advanced developments in theater construction, especially with regard to the electrical installation. It is located near 47th street and Ashland avenue, in the heart of the stockyards business district. It was built by the People's Theater Co., an organization of the business men of this community, for the presentation of vaudeville and variety shows and will be managed by James Schaeffer.

The building is fireproof, of concrete and brick construction throughout, and contains in addition to the theater four small one-story stores which have a depth corresponding to the depth of the foyer of the theater. The facade is faced with terra cotta and a canopy extends over the sidewalk in front of the entrance. The theater itself is 91 by 121 ft. and has a seating capacity of 2200.

The interior is pleasingly decorated and no expense has been spared in providing every convenience and comfort for the patrons. All objectionable posts and pillars have been eliminated in the design and a full

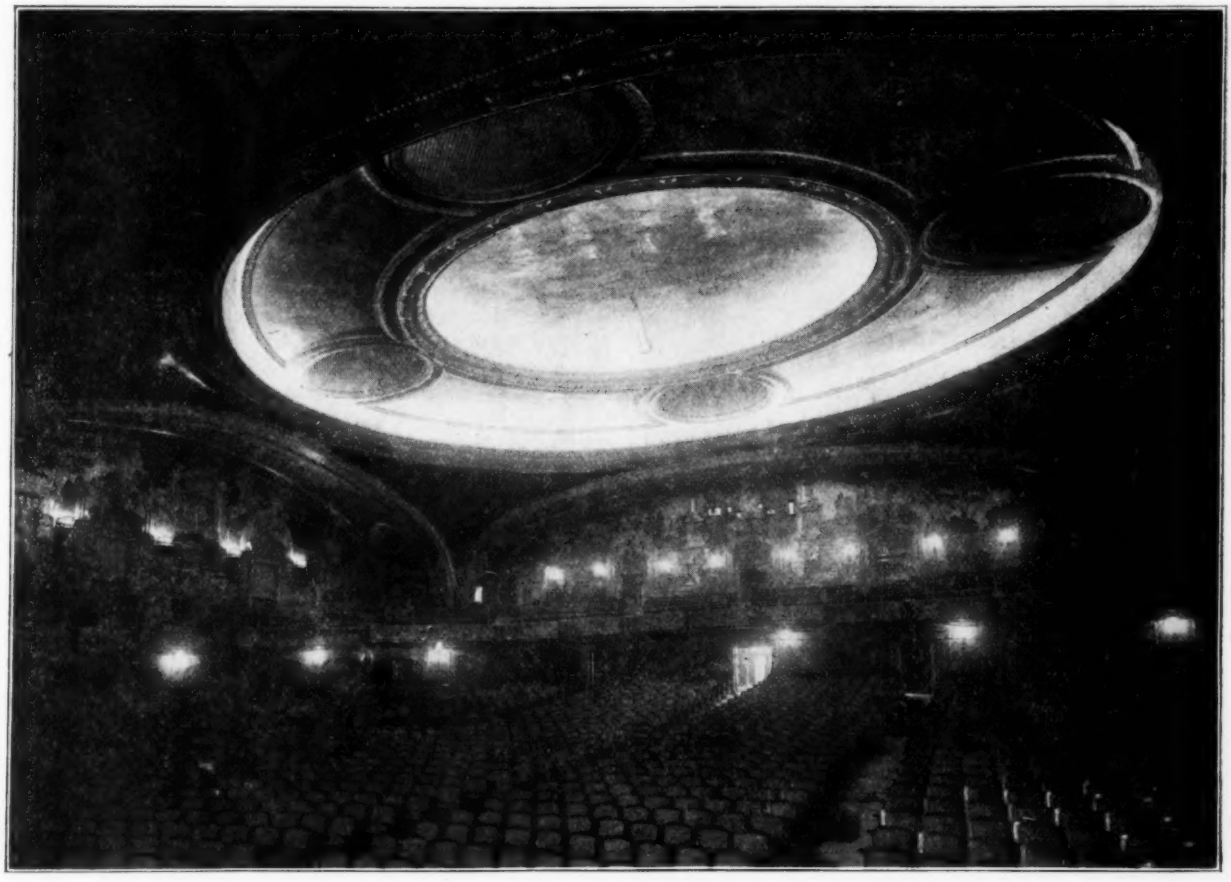


Fig. 1.—View of Auditorium of People's Theater, Chicago, as Seen from the Stage Showing Cove Lighting Effect of Ceiling Panels.

view of the stage may be had from any seat in the house. The stage is one of the largest in the country being 35 ft. deep with a proscenium opening of 53 ft.

Description of Main Feeder Installation.

The electric power is supplied from the overhead distributing system of the Commonwealth Edison Co. The lighting service is 3 wire, 115-230 volt, alternating current and is taken from a 100-kw. transformer located on a pole close to the lighting service outlet. The power is 3 phase, 230 volt, 60 cycle. In addition to the general lighting and power services, separate power and lighting services are provided for the fire pump and emergency lighting.

The general lighting service consists of 3 1,000,000 c.m. cables and the general power service, 3 No. 00. The fire pump service is 3 No. 0, lead-covered cables, while 3 No. 14 wires supply the emergency lighting. All of these services enter the building in a small room in the basement in which is located the fire pump and fire-pump control panel. The main service switches and all metering equipment are also in this room.

Features of Lighting Installation.

Two branch feeds are taken from the general lighting service switch panel. One, 3 No. 0 cables, feeds directly to a distribution panel situated in the lobby. This panel contains the fuse blocks from which the power for the lobbies, foyer and outside lighting are supplied. The other branch which consists of 3 800,000 c.m. cables goes to the Major distribution panel which controls the remainder of the lighting equipment, including the outside sign.

The outside of the theater is brilliantly illuminated by seven floodlights installed along the top containing 250-watt, type C lamps, equipped with reflectors. In addition, 75 75-watt, type C lamps are installed around the edges of the canopy. The sign, installed over the

Fig. 2.—Exterior of People's Theater.

canopy, contains 780 10-watt lamps, of various colors, which spell the name "PEOPLE'S" surrounded by an attractive flashing border.

Six massive pendant fixtures, bronze finished, provide the lighting for the lobbies. These fixtures contain 100-watt, type C lamps, inclosed in suitable glass shades which soften and diffuse the light and are studded with numerous round frosted bulbs which add greatly to their appearance. The foyer and rest rooms are lighted by small bracket and ceiling fixtures which harmonize with the decorations.

The main auditorium is illuminated by two rows of lamps concealed in the cove of the large panel over the center. As can be seen from Fig. 1 the result is very beautiful, being much more uniform than it appears in the illustration. These rows contain 400 40-watt lamps and the light is projected by suitable

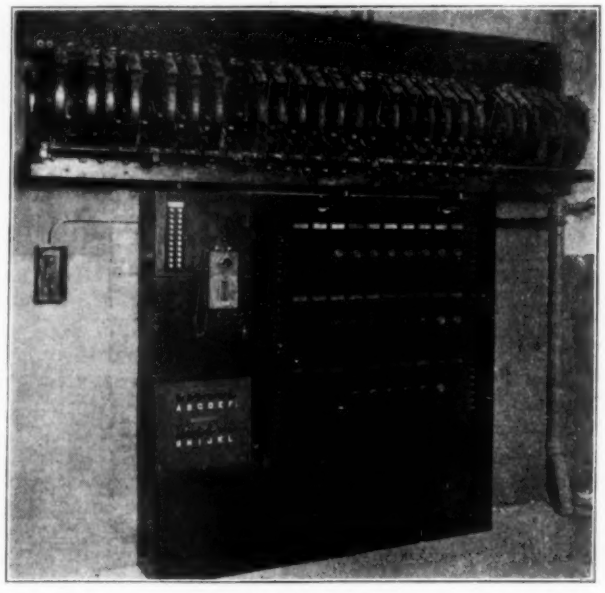


Fig. 3.—Major Pilot Board Showing Arrangement of Switches.

reflectors onto the panel from which it is reflected upon the body of the house, thus giving an indirect lighting. The decorations of the panel blend with the decorations of the rest of the ceiling and are designed to give an effect similar to looking up into a blue sky flecked with white clouds. The lighting has been greatly intensified by covering the surface of the panel with aluminum leaf before painting. A small space, invisible from the main floor or balcony, has been provided between the top and bottom sections of the panel to facilitate the renewal of lamps. This is especially desirable for such a lighting effect is easily spoiled if a small number of the lamps are not lighted.

A very desirable feature has been developed in connection with the control of this lighting. The entire lighting of the cove is controlled by automatic contactors located on the contactor panel, which is described further on in this article. These contactors are actuated by push-button switches, the one on the stage is operated by the stage electrician and the other, in the projector booth, controlled by the operator there. The dual control thus effected adds greatly to the safety of the theater, for it is evident that in the event of a fire or other trouble occurring the possibilities of leaving the house in darkness are minimized. It is also much more convenient for the operators. The wiring of the lights is so arranged that alternate lights are controlled by the same switches which permits the total illumination to be reduced one-half without using the dimmers. The entire arrangement, however, may be regulated by dimmers located on the stage.

Many of the latest and most modern developments are to be found in the lighting equipment of the stage. The proscenium and border strips are constructed of

galvanized iron, the inside of which has been covered to give adequate reflection. They are equipped with 300-watt, type C lamps, each lamp being set in an individual compartment. Each compartment is provided with a holder on the open side into which may be inserted slides of any desired color. There are four borders and two proscenium strips which contain a total of 175 lamps. The center lamp in each border is

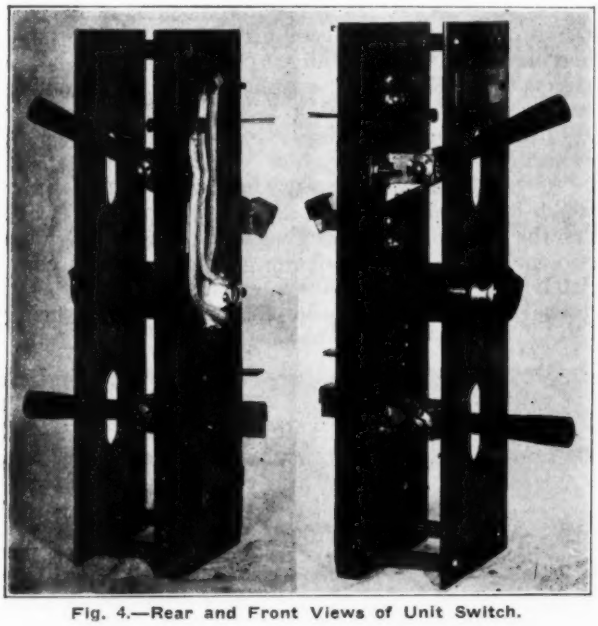


Fig. 4.—Rear and Front Views of Unit Switch.

controlled by a separate switch, so that it is not necessary to burn the entire border when setting scenes, etc. They are connected by flexible cables to outlet boxes located on the first flyfloor. The foot-lights contain 275 60-watt, type B lamps, of various colors.

Twelve 50-amp. double stage-pockets are provided to accommodate the spot-lights, portable bridges, etc., used on the floor back of the stage. In addition, two permanent bridges equipped with suitable pockets have been built at each side of the stage at the front.

Major Remote Control Dead-Front Switchboard.

Many state and municipal authorities, realizing the dangers from accidental contact with the open switches on live-front switchboards, have required that such boards be of the dead-front design. The board used in this theater is one of the most successful types of dead-front control which have been developed thus far to meet this requirement. It also embodies many safety and convenience features which add greatly to its desirability. It was originated by R. E. Major of Chicago and in this installation controls not only the stage lighting equipment, but also the lighting of the auditorium.

The system consists of two sections. The pilot board, shown in Fig. 3, which is made up of a number of switch units and which is placed in any position on the stage where the electrician can follow the scenes and make the necessary changes. Being composed of a number of single small units, which can be assembled and set up on the job, this board may be easily set in a desired location without any trouble. This feature also adds the advantage of permitting a board of the required size to be delivered immediately.

A single unit switch is shown in Fig. 4. These units consist of two small double-throw switches and a signal light. The switch handles protrude through a steel face plate which has openings large enough to allow the switches to be operated. The clips for these switches are arranged so that when the handle is set in the up or permanent position it will remain in place, but must be held in the down or momentary position. The action is made more positive by means of a spring which tends to hold the blade in the neutral position when not in use. The top handle of each unit is for closing the circuit and the bottom handle opens it.

The other section of the control is the contact panel shown in Fig. 5. This panel may be located any place as close as possible to the center of distribution, preferably under the stage. On this panel are mounted the necessary fuse blocks and automatic contactors. Each contactor is equipped with an opening and a closing coil which are operated by the corresponding pilot board switch. The contactors, however, are held in place mechanically, current being used only in operating them.

The operation of this control system is very simple and has many advantages over the old style live-front board. The unit switches for the borders, foot-lights and proscenium strips are arranged in rows according to color controlled. These switches are in turn controlled by color-main switches located to the left of the row, and the color mains are controlled by the stage main situated to their left. Any switch when set in the permanent position will not operate until either the controlling color main or stage main is thrown into its momentary position when it operates either to open or close the contactor. Any unit switch, either closing or opening, may be operated separately, however, by throwing it into the momentary position. By this arrangement any possibility of leaving the current on the operating coils is avoided.

The permanent contact, therefore, is only used in

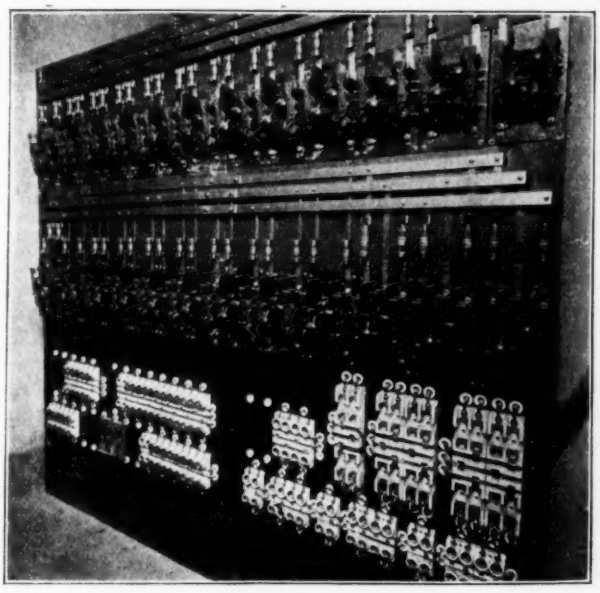


Fig. 5.—Contactor and Fuse Panel.

"setting up" scenes, etc., and by its use it is possible to set up several scenes in advance without affecting the scene in progress. In such cases the operator can set the necessary units in the permanent position and operate them simultaneously by the main control. The value of such an arrangement when an elaborate, spectacular scene is to be shown, is easily understood.

On the pilot board are also mounted push-button

switches which control the lights for the entire theater with the exception of those supplied from the circuit panel in the lobby. This arrangement is also desirable since it puts the final lighting control in the hands of the chief electrician, and if an operator in another part of the stage makes a mistake he can easily rectify it. On this board are also mounted the control switches for the alphabet signs, one of which is located on each side of the stage. By operating these switches any letters from A to L inclusive, designating the act in progress, appear illuminated on the signs.

Heating and Ventilating System.

The heating and ventilating system is designed to conform to the Chicago requirement, which calls for 25 cu. ft. of air per minute per person. Fresh air is drawn into the basement through a 5 by 10 ft. shaft which extends above the roof of the building by a large blower. This blower is operated by a 20-hp. 1140-r.p.m. slip-ring motor, belt-connected, and has a capacity of 55,000 cu. ft. per min. At the bottom of the shaft 3300 sq. ft. of heating sections have been installed, which heat the air as it passes through. After passing through these coils the air is driven out into the auditorium through 350 mushroom ventilators located under the seats and numerous sidewall registers. The vitiated air passes out into the open air through grilled openings in the ceiling.

Fire-Pump Installation and Control.

In modern theater construction fire prevention is a matter of great importance and the "Peoples" is no exception to this rule. As has been stated the building itself is of fireproof construction and every precaution has been taken to minimize the fire hazard.

An elaborate automatic sprinkler system has been installed, the water for which is supplied from a 2500-gal. tank situated on a steel tower above the roof of the theater. This tank is filled by a centrifugal pump, located in the basement, having a capacity of 250 g.p.m. which is direct-connected to a 30-hp. 1720/860 r.p.m. slip-ring motor.

This motor is started and controlled by an automatic and hand-operated Sundh fire-pump control panel. This particular board which is shown in Fig. 6 was designed to meet the requirements of the Chicago Bureau of Fire Prevention and Public Safety. It is operated either by hand or automatically by a float switch in the tank on the roof. This float switch, when the water falls below a predetermined level, which in this case is about 18 in. below the top, energizes the contactor shown in the lower-right corner of the panel. This contactor in turn operates the upper contactors which close the motor circuit and control the various starting resistances. These resistances are then released by the auxiliary contactors which operate on a cam, timed by the dashpot shown in the upper-left corner. In the manual operation the action of the first contactor is eliminated, the large contactor being closed directly by raising the lever 45°.

By using the water pressure in the tank to operate the steel curtain a check is kept on the operation of the float switch. This hydraulic power is obtained through a pipe which extends into the tank to about the same level as that at which the float switch operates. If for any reason, therefore, the switch fails to act when the water has fallen below the proper level, it is impossible to raise the curtain. The water level has been fixed so that the tank must be filled after the curtain has been raised four times, which means after every two performances.

Another item of interest in connection with the fire-pump installation is the throw-over switching arrangement for testing the motor and replenishing the water in the tank at these periods. The fire-pump is supplied by a separate lead-covered cable service and is measured by a separate meter. As the total consumption is very small in comparison to the size of the motor the service for such installations is usually charged for on a minimum basis, which being much higher than the actual consumption rate, is not, of course, desirable. To accomplish this and at the same time eliminate any possibility of having the fire-pump left on the building service, the throw-over arrangement which is shown in Fig. 7 has been developed by the Commonwealth Edison Co. and the inspection authorities.

As can be seen from the diagram a double-throw switch is connected to both the general power service and the fire-pump service in such a way that when thrown in one position all the general power is completely cut off and the fire-pump is connected to the general power service,—the fire-pump service being

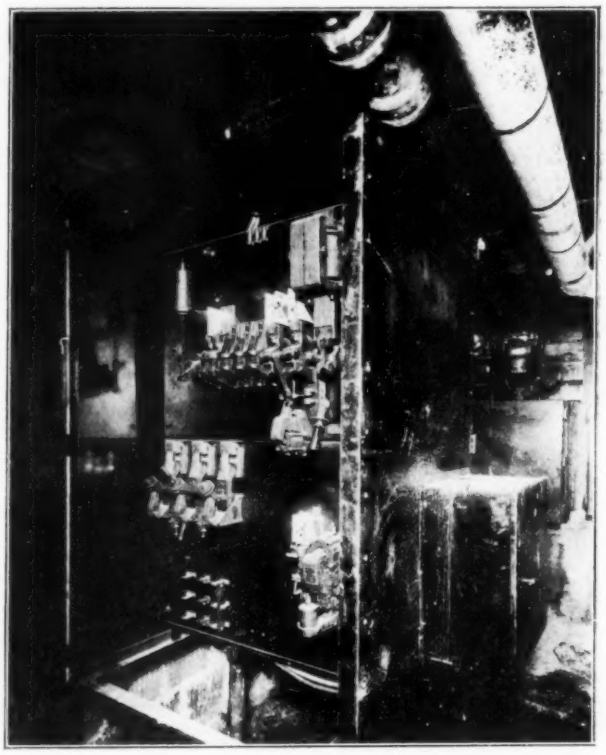


Fig. 6.—Sundh Automatic and Manual Fire-Pump Control Panel.

disconnected. It is evident, therefore, that with the switch in this position the consumption of the fire-pump will be registered on the general power meter but cannot be accidentally left in this position or forgotten for the balance of the power is cut off. In the other position, with the handle on the right side, the general power is connected to the general power meter and service and the fire-pump is connected alone to the meter and service. As no consumption is registered on the fire-pump meter during the operation the minimum rate is not charged.

For additional fire protection a large fire damper has been installed in the roof over the stage. This damper is controlled by a closed circuit connection which is operated by closing either one of two single-

pole switches located on each side of the stage convenient to the operators. One of these switches is shown in Fig. 3 to the left of the pilot board.

Other Features and Summary.

Numerous other interesting features have been installed in connection with the electrical work. To enable the different sections of the theater to keep in close touch with each other, a Couch intercommunicating telephone system with 14 stations located in various parts of the building has been installed. The batteries for this system are located at the pilot board on the stage and are charged from the synchronous converter located in the projector booth. This converter is of 10 kw. capacity and is used for converting the three-phase power current into direct current used for operating the moving-picture machines, spot-lights,

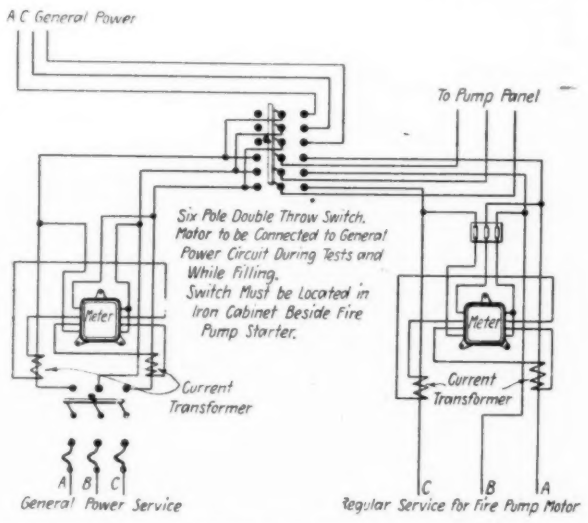

A C General Power
To Pump Panel
Six Pole Double Throw Switch. Motor to be Connected to General Power Circuit During Tests and While Filling. Switch Must be Located in Iron Cabinet Beside Fire Pump Starter.
Meter
Meter
Current Transformer
Current Transformer
A B C
General Power Service
C B A
Regular Service for Fire Pump Motor

Fig. 7.—Diagram of Throw-over Switching Arrangement for Fire Pump.

etc., which are used in the booth. The booth itself is located opposite the stage above the gallery. All the cleaning of the theater will be done by electrically-operated apliances and for this purpose 14 floor outlets have been installed for attaching vacuum cleaners and scrubbing machines. In addition, two 2-hp. direct-connected sump pumps have been installed in the basement for pumping bilge seepage and sewage.

The building was designed by and constructed under the supervision of C. W. & G. L. Rapp, architects, 69 West Washington street, Chicago. The electrical work was installed by J. L. Burgard, electrical contractor, 751 West 54th place, Chicago. Robert Stone has been engaged as house electrician of the theater and will have charge of the operation and maintenance of the equipment.

A partial list of the equipment used, together with the size and the name of the manufacturers furnishing it is reproduced at the bottom of this page.

ELECTRICAL EDUCATION FOR SOLDIERS PROVES ATTRACTIVE.

Every Branch Available Free to Disabled Discharged Men of the United States Forces.

Electricity in all its branches is proving immensely attractive to the disabled soldiers, sailors and marines who are taking the free trade and professional education placed at their disposal by the United States Government, through the Federal Board for Vocational Education. Men who had a smattering of electrical information before the war are now given the opportunity to perfect themselves and become really skilled in the particular branches which they have chosen. This training embraces both practical and theoretical work, such as may be obtained in the Massachusetts Institute of Technology, Case School of Applied Science, Georgia "Tech," with practical training with the General Electric Co. and other concerns and in plants of some of the great power companies.

Men taking the courses are, if unmarried, supported by an allowance of $65 per month from the Federal Board; more is given if the man has dependents. There is no set time in which a course must be finished. The sole criterion is the ability of the man to carry on under commercial conditions. If it is a wage-earning branch of the trade he is qualifying for, a position is ready for him when he is ready for it, the placement division of the Federal Board having arranged for the employment. The Federal Board for Vocational Education, whose address is Washington, D. C., is anxious to hear from any war-disabled soldiers who are interested in this free training provided by the government, not as a charity but as a matter of justice to disabled men who have been impaired in the nation's service.

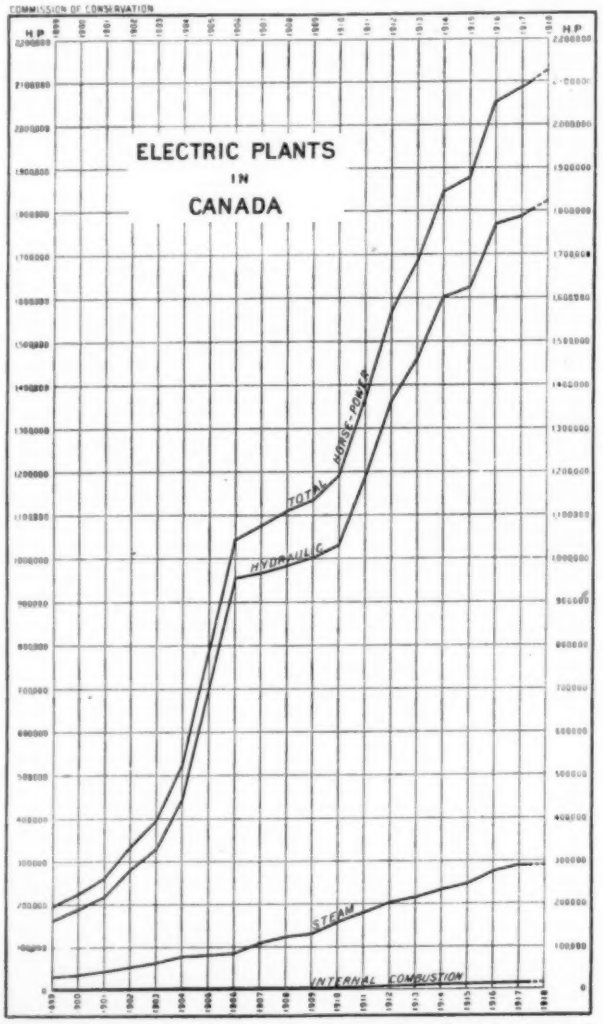
Article.	Type and Size.	Manufacturer.
Border Lights and Proscenium Strips		R. E. Major, 2353 Wilson Ave., Chicago.
Conduit	Loricated—Various sizes	American Conduit Co., New Kensington Pa.
Pilot Board Equipment		R. E. Major, Chicago.
Remote Control Contactors	110 volt-100 amp. alternating current	Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Dimmers	110-step interlocking	Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Fire Pump	250 g.p.m.	Dayton-Dowd Co., Chicago, and Quincy, Ill.
Fire-Pump Control	Sundh	Sundh Electric Co., Chicago and Newark, N. J.
Fire Pump Motor	Watson 30-hp. 1720/860 rpm., slip-ring	Mechanical Appliance Co., Milwaukee, Wis.
Fittings and Stage Pockets	Sprague	Sprague Works of General Electric Co.
Floor Plugs and Other Outlets		Hart & Hegeman Mfg. Co., Hartford, Conn.
Lighting Fixtures		Victor S. Perlman & Co., Chicago.
Reflectors, Cove	No. 750	Nat'l X-Ray Reflector Co., Chicago.
Reflectors, Floodlights	No. 51	Nat'l X-Ray Reflector Co., Chicago.
Synchronous Converter	Martin 10 kw.	Northwestern Electric Co., Chicago.
Signs	Outside and Alphabet	Advance Sign Co., Chicago.
Samp-Pump Motors	Century 2 hp.	Century Electric Co., St. Louis.
Sprinkler System	Globe	Globe Automatic Sprinkler Co., Philadelphia, Pa.
Switchboards		Chicago Switchboard Co., Chicago.
Telephone System	Couch 14-station	S. H. Couch & Co., Norfolk Downs, Mass.
Ventilating Fan	American	American Radiator Co., Chicago.
Ventilating Motor	Watson 20 hp. 1140 rpm.	Mechanical Appliance Co., Milwaukee, Wis.
Wire	Simplex	Simplex Wire & Cable Co., Boston, Mass.
Wire	Atlantic	Atlantic Wire & Cable Co., Stamford, Conn.

Electrical Generation and Distribution in Canada

Comprehensive Report by Commission of Conservation of Canada Shows Hydroelectric Power Constitutes over 85% of Total—Extensive Interconnected Networks in Provinces of Ontario and Quebec

FAILURE, through obstructive tactics in the Senate prior to the adjournment of the Sixty-fifth Congress on March 4, to enact the compromise water-power bill and other important national legislation, although the necessity for constructive Federal action on water power has been much discussed and quite generally agreed upon for some seven or more years, brings the dilatory attitude taken in our country into strong contrast with the progressive policy followed in our neighbor to the north—Canada. Figures just recently made public show that over 85% of the electric power of that enterprising country is developed from water power.

These and other facts intensely interesting to electrical men are contained in a 296-page illustrated report, entitled "Electric Generation and Distribution in Canada," prepared under authority of the Commission of Conservation of Canada, by Leo. G. Denis, its hydroelectric engineer. The object of the report was to show the important place electrical energy occupies in Canada and at the same time provide the various companies, bodies and individuals concerned therewith with information regarding the operation and general conditions obtaining in the generating plants, transmission and distribution systems. The report also serves as a general power survey of the Dominion, since in most cases the kind of power used to operate an electric plant in a certain district will be found the most advantageous that may be used. It is the most complete and thorough report on Canadian electrical power as yet prepared.



Curves Showing Rapid Growth of Canadian Electric Central-Station Plant Capacity and the Character of the Prime Movers, Which Is Predominantly Hydraulic.

The information shows that there is a total of 565 electric generating plants in Canada, with an aggregate capacity of 2,107,743 hp., and supplying not less than 752 distributing systems of varying importance, which cover some 973 places. If we group the plants according to the kinds of prime movers, we find:

	Horsepower.
270 Hydroelectric plants, aggregating	1,806,618
201 Steam plants, aggregating	288,202
49 Gas plants, aggregating	8,157
45 Oil or gasoline engine plants, aggregating	4,766
	2,107,743

Practically all of the gas-driven plants are producer-gas engine plants.

It is often pointed out that Canada is very favorably endowed with primary power resources and, except for a portion of the Middle West, either water power or coal is found in abundance, while in British Columbia, both resources; in fact, some coal mines there are operated by hydroelectric energy.

The situation in various parts of Canada is well illustrated by the figures in the report. Steam and water power are both utilized in the maritime provinces with a predominance of the former. In Quebec, Ontario and eastern Manitoba, water power is the dominating source of power, every large center and most of the smaller ones being supplied by electricity produced from water power, either through the extensive network of transmission lines fed from large developments or by smaller local plants. In the Middle West, large plants are steam-operated, while the smaller ones use internal-combustion engines. In British Columbia and western Alberta, one again finds water power predominating,

but the generous coal supply in certain districts also permits considerable steam operation.

In large hydroelectric installations usually the works are of most substantial construction, and the most expert engineering advice has been obtained, while the equipment is in keeping and comprises both hydraulic and electrical machinery of the most efficient type. The same cannot be said of many of the small plants and, particularly in the older ones, there is undoubtedly great room for improvement. The old wooden dams are usually very leaky and, especially on small streams, a considerable proportion of the flow is wasted, while the remaining water is often lost in a vain effort to operate an obsolete and inefficient water-wheel, installed years ago and never properly repaired and adjusted. In many cases these defects are the real cause of a shutdown from lack of water in winter.

The same comment applies to the steam plants; the large ones, although a number of them are only used as auxiliaries, are very efficiently equipped and operated, but many of the small plants show much room for improvement. It cannot be expected, however, that a small plant will show the same efficiency and economy of operation as a large one. As auxiliary plants only operate intermittently, the question of economical operation, while most desirable, naturally does not receive the same consideration as in plants operating continuously, and the latter can stand much heavier overhead charges, so long as such charges result in increased efficiency and reduce operating costs. There are many small plants in the prairie sections, where the price of fuel is high, the majority of them using oil, gasoline or producer gas. Considering such municipalities, and others in their vicinity which desire electric service, it would seem, says Mr. Denis in his report, to be worth while to generate energy in large steam plants, situated at suitable distribution centers, and thus supply transmission systems extending to the various communities within economic radius. The larger the plant, the greater the economy, up to plants of some 50,000 kw. or more.

Ownership of Plants.

The ownership of the various plants included in the report is divided into 207 municipal or publicly owned plants of 452,508 hp. total capacity, and 358 privately owned plants of 1,655,235 hp. total capacity.

Typical examples of the two kinds of ownership are furnished by two of Canada's largest systems; the Niagara system of the Ontario Hydro-Electric Power Commission, with a total load of over 201,000 hp., supplying some 120 municipal distributions and covering an area approximately 210 miles by 85 miles; and the system of the Shawinigan Water & Power Co., in the province of Quebec, with a total load of 205,000 hp., supplying some 76 distribution systems directly or indirectly and covering a triangular area of 140 miles base by 75 miles in height.

The activities of the Hydro-Electric Power Commission, which are thoroughly described in the body of the report, have been a great incentive to municipal ownership in Ontario, but one also finds many municipal systems in other provinces. In Quebec, for instance, while the great bulk of the energy is distributed under private ownership, there are a number of municipal systems, some obtaining their supply in block from the Shawinigan and other large non-public systems. In the prairie provinces, with very few exceptions, all the larger and many of the smaller systems are operated under municipal control.

The plants vary greatly in size; the largest hydroelectric development is 448,800 hp., in the three large power plants at Niagara Falls; the large installations are not all confined to this site, however, there being 5 plants of over 100,000 hp. and 36 plants of over 10,000 hp. capacity. The largest single plant is the Ontario Power Co., now operated by the Ontario Hydro-Electric Power Commission at Niagara, with a total capacity of 211,300 hp., while the largest single unit is 20,000 hp., at Grand'mère, Quebec. The average head of water utilized is not exceedingly high, but many of the large hydroelectric plants operate under fairly high heads, such as 140 to 180 ft. at Niagara, 145 ft. at Shawinigan, 83 ft. at Grand'mère and 400 ft. at the Coquitlam-Buntzen plants near Vancouver. The highest head in eastern Canada is 540 ft., at the 8000-hp. plant at Eugenia Falls, Ont., while in the West, there is a head of 1820 ft. for hydroelectric purposes at Britannia Beach, B. C., where the development also provides a total head of 3530 ft. in two steps of 1450 ft. and 2080 ft. for the direct operation of other machinery. On the other hand, one of the largest plants, recently installed at Cedars, Quebec, operates under a head of only 30 ft.

The plant at Hamilton, Ont., 26,667 hp., is the largest steam-power plant in Canada and is used as an auxiliary, while the plant at Edmonton, Alta., 14,234 hp., is the largest steam plant operated continuously.

Although the service from hydroelectric plants, where long-distance transmission is necessary, is becoming much more reliable, the investigation disclosed that many of them were provided with auxiliary steam plants. Some of these auxiliary steam plants are used not only in emergencies but at regular periods during certain years when low water prevents the water-power plant carrying its full load.

Conservation Reservoirs.

It is most interesting to note the very rapid increase in the use of stored water in connection with Canadian hydroelectric developments, both large and small, and no less than 59 plants report the successful operation of this method of providing for increased flow at low-water periods. Many difficulties encountered in the early years in connection with efficient operation seem to have been overcome by careful observation and study of conditions from year to year. By carefully regulating the release from storage reservoirs, water is successfully conveyed over long distances to the power plant and with a minimum of loss. Among government undertakings of this nature may be mentioned the three large reservoirs at Lakes Timiskaming, Kipawa and Quinze to regulate the flow of the Ottawa River; La Loutre reservoir on the St. Maurice River; Lake St. Francis dam for the river of the same name; the extensive system of small conservation reservoirs on the Trent River, Ont., and Lake Minnewanka, on the upper waters of Bow River; also the reservoirs on Jordan River and Goldstream, near Victoria, of the British Columbia Electric Railway Co. Many of the plants reporting are enthusiastic respecting results obtained from individual undertakings and frequently the capacity has been raised to double or more. In connection with water-conservation operations, difficulties sometimes arise in apportioning among the various users the charges for the stored water.

Although much has been accomplished of late years in the way of preventing or minimizing ice troubles, there are still a number of complaints respecting such difficulties. In most cases, it is probable that they could have been avoided had proper precautions been

taken, but, frequently, on account of their intermittent occurrence, the requisite measures are not taken until the troubles have actually developed.

Types of Generators and Character of Loads.

Practically all energy for distribution is generated as alternating current. The types of generators comprise various phases, frequencies and voltages. All large plants and a great many of the smaller plants operate as three-phase; a number of the older plants, some of a fair size, still use two-phase, while the single-phase systems are confined to small plants which have also been installed for some time. The principal frequencies used are 60, 30 and 25 cycles, while frequencies of over 100 cycles are still found in the older plants of small size.

There is naturally a great variety of generator voltages, these being adapted to suit the most economic power-plant design. In plants supplying distribution systems direct at the generator voltage, 2200 volts predominate; also 550 volts where a large amount of motive power is supplied near the plant; also 12,000 volts in plants where all or a portion of the energy is transmitted a certain distance at this voltage. With the exception of electric railway service and in a few places for a portion of the industrial power service, direct-current generation is practically confined to very small plants. Such plants sometimes use storage batteries to provide continuous service, while the generating units operate only a portion of the time.

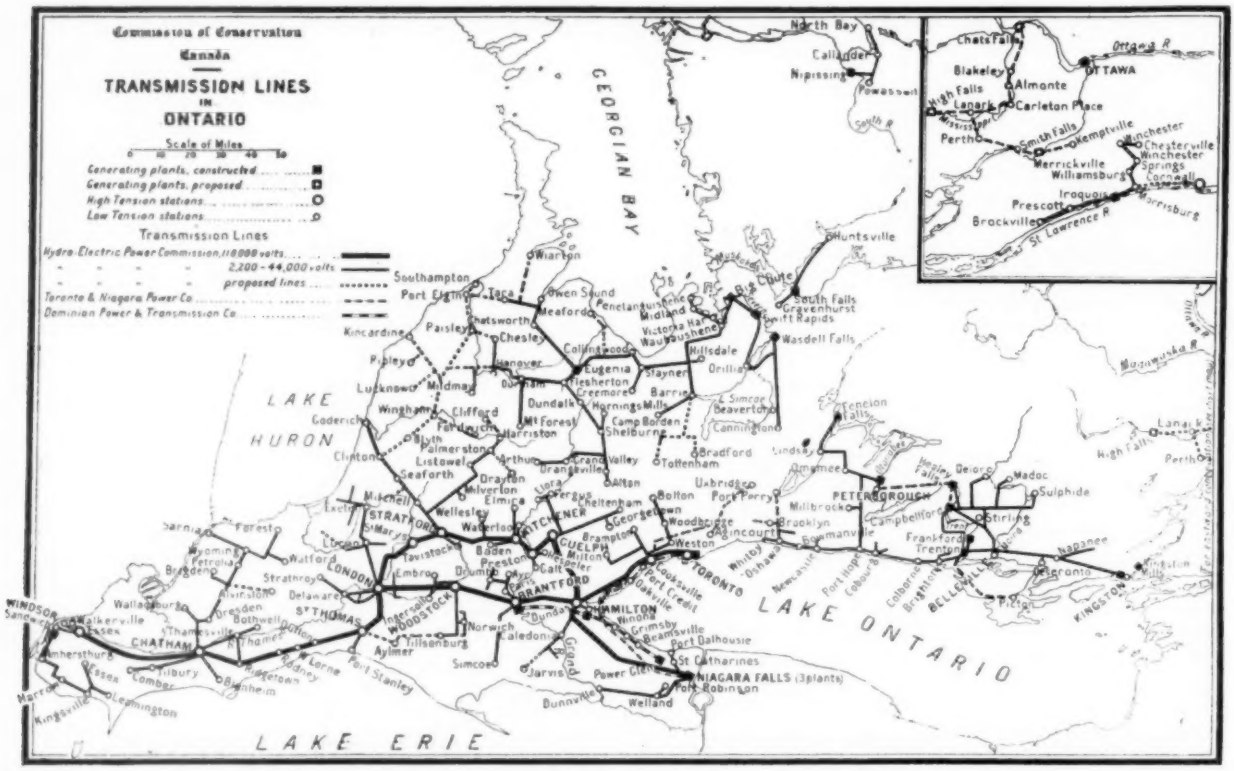
The aggregate maximum demand on the plants included in the report is 1,078,298 kw., of which 1,003,955 kw. is on hydroelectric, 69,924 kw. on steam, and 4419 kw. on internal-combustion engine plants. The division between the various services, such as lighting and power, could not be obtained from all plants and systems, but available data indicate that 31% is used for lighting, 59% for power and 10% for miscellaneous purposes. For the larger hydroelectric plants, the load-factor usually varies from 50 to 80%, while in plants supplying large loads for metallurgical or chemical purposes, it may reach from 90 to 100%. On steam plants of fairly large size, 30 to 40% load-factor is usually recorded, but 60% is reached in exceptional cases where the load comprises mainly mining or other industrial operations requiring 24-hr. power.

Of the various plants, 274 give a continuous service, night and day, while 220 give only a night service, but, as the latter only comprise small installations, their total capacity is relatively unimportant. The remaining 71 plants are used as auxiliaries.

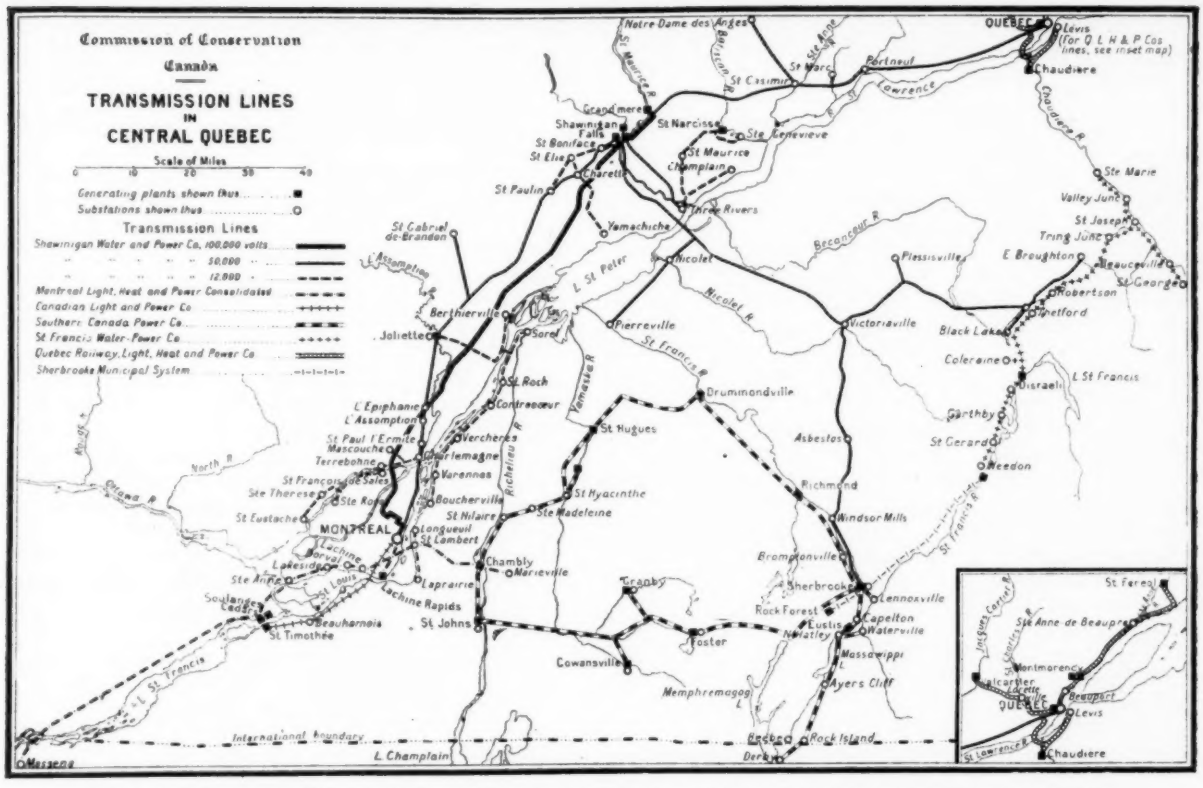
Cost of Generation.

It is very difficult to obtain accurate data on cost of generation which could be used to compare conditions at various plants. An attempt to keep a record of this information is made in most plants, but the manner of arriving at it varies greatly. The chief difficulty lies in the inclusion for certain plants and omission in others of various items which are comprised in the total cost given. In some cases, the overhead charges are left, which leads to very erroneous figures, especially in hydroelectric plants; in certain steam plants, only fuel and oil costs are considered. On the other hand, some plants keep this information in a very accurate and detailed manner. Such plants include all chargeable items, subdividing the total cost into various parts and extend it to the transmission and distribution costs.

The cost of generation for hydroelectric plants is usually given in dollars per hp.-year, and among the lowest reported is a cost of $8.50 per hp.-year, the plant being only some 10,000 hp. capacity, but operating under a 90-ft. head; for very large plants, the cost should be even substantially lower, while for plants of the same order it varies from $8.50 to $15



Electric Power Transmission Systems in Ontario, Showing Extensive Lines of Hydro-Electric Power Commission and Other Networks.



Electric Power Transmission Systems in Quebec, Showing Shawinigan and Other Interconnected Networks.

per hp.-year; in smaller hydroelectric plants, $30 to $40 per hp.-year may be reached.

Steam-plant costs are more often expressed in cents per kw-hr. and they vary greatly with the service, size of plant and with its geographic situation, as affecting the price of fuel; in steam plants of over 500 hp. capacity, the reported generating cost varies generally from 0.7 cent to 5 cents per kw-hr., while in smaller plants it varies from 3 to 15 cents per kw-hr.

Transmission and Distribution Lines.

Transmission lines in Canada operate under many different voltages up to 110,000 volts. There are only three systems using over 100,000 volts, namely, the Niagara system of the Ontario Hydro-Electric Power Commission, the Shawinigan Water & Power Co., and the Montreal Light, Heat & Power Consolidated on the line from its Cedars plant to Massena, N. Y. Lines of various voltages from 10,000 upward aggregate 5490 miles and are as follows:

	Miles.
10,000 to 30,000 volts aggregate	2428
30,000 to 99,000 volts aggregate	2485
100,000 volts and upwards aggregate	577
	5490

The cost per mile of the different lines naturally varies with the mode of construction, size and number of conductors and voltage for which constructed. For voltages of from 10,000 to 50,000 volts, the figures given show a wide variation of from $600 to $11,000 per mile, while on 100,000-volt lines and over, from $7500 to $14,000 per mile.

Iron-wire transmission lines have been used in many instances lately, owing to the high prices of copper and aluminum. The use of iron wire seems well adapted for short extensions and rural distribution, but in some cases it has also been used on fairly long lines.

The figures of distribution give a general idea of the relative extent and importance of the various systems. Of the 752 distribution systems in Canada, 389 are municipal or publicly controlled, while 363 are under private ownership. The systems included cover a total of 11,852 miles of streets and supply 730,697 consumers with an estimated connected load of 497,846 kw. for lighting and appliances and 970,505 hp. for power.

The prevalent primary voltage of distribution is 2200 volts, or from 2000 to 2400 volts, but 4000 to 6000 volts is becoming more and more used, particularly in rural distribution and systems comprising a number of small centers within 8 or 10 miles of the local source of supply. A number of systems still use 1100 volts, but practically only in old systems installed before this voltage had been superseded. Lower distribution primary voltages of from 500 to 600 volts are only used in rare instances where large power loads are supplied directly at this voltage from the local source of supply, while line transformers stepping down to 110 volts are used to supply the lighting consumers. The secondaries for lighting are usually at 110 volts or from 100 to 120 volts, but, in many cases, three-wire secondary distribution is used with 110 volts on each side. For motive power, large motors are supplied direct at the primary voltage of 2200 volts, while for smaller motors the secondary voltages are usually either 220, 440 or 550 volts. With a few exceptions, direct-current distribution is found only in very small systems, some taking advantage of this to utilize storage batteries to supply a continuous service.

The information relating to line transformers was not obtainable in certain cases, but, with a fair esti-

mate of the deficient data, the total number is 61,100, giving an aggregate capacity of 607,000 kw.

Street Lighting.

Incandescent lamps, particularly since the advent of gas-filled lamps, have been replacing inclosed arc lamps for street lighting. According to the report, however, inclosed arc lamps are used in 73 places. The prevalent size of incandescent lamps is 100 watts, while lamps of from 25 watts to 1000 cp., both vacuum and gas-filled tungsten, cover the range found in use. The operators of certain small plants have indicated their prejudice against gas-filled lamps for street lighting, the reason given being that of short life. A study of the situation seems to indicate that, as this complaint only comes from the smaller plants, the cause of this short life is, in all probability, improper regulation, *i. e.*, too high amperage or voltage, the operator not being provided with proper station instruments to govern operation. As against this prejudice, may be cited the case of a small town in British Columbia provided with proper instruments, where rough tests of gas-filled lamps demonstrated that a very long life could be obtained by running them slightly under voltage.

The rates or charges allowed for street lighting show much variation in different places. Some of the higher rates per lamp per year, are: Luminous or magnetite arc, $95; enclosed arc, $90 to $125; 100-watt lamp, $48; 300-watt lamp, $75. Some of the lower rates per lamp per year, are: Luminous or magnetite arc, $46.51; enclosed arc, $40; 100-watt lamp, $3.30; 400-cp. lamp, $8.40; 1000-cp. lamp, $50. In a number of places, the street-lighting service is charged on the meter rate at so much per kw-hr.

The report gives in pleasingly readable fashion comprehensive data and general information about the electrical generating, transmitting and distributing system in each city and town of the Dominion of Canada. These data are also summarized in convenient tabular form. There are numerous halftone illustrations and diagrams. Three of the most striking are reproduced herewith. One shows very graphically the rapid central-station development of the country and the very great preponderance of hydro-electric power. The two others show the very great extent to which interconnection has been carried in Canada's two principal provinces, Quebec and Ontario, the former being a network of several systems, while the latter is operated almost exclusively by the Hydro-Electric Power Commission of Ontario and its subsidiaries.

THE FORT DODGE MUNICIPAL DAM.

The accompanying illustration shows the municipal concrete dam at Ft. Dodge, Ia., utilized in connection with the power house to generate electric power for the water works pumping plant, light and power service.

This city has 30,000 population and is located on the Des Moines river, and being an inland city, and a long distance from any large body of water, a lake for fishing, boating and bathing was very desirable and was advocated by Mayor John F. Ford for a number of years before the public saw its desirability. It was finally constructed, the spillway section of the dam being 230 ft. long and of solid construction. The dam has a height of 18 ft. above the bed rock of the stream, with a concrete toe 4 ft. deep and 3 ft. wide on the up-stream side. The concrete portion of the entire structure is 412 ft. wide, including a concrete fish-ladder at one end as required by the state law of Iowa. One hundred and thirty feet of the dam consists of five sluice gates of the Tainter type, built of structural steel, with a radius of 17 ft., and arranged so that all five gates may be raised by a motor propelled electric hoist, allowing the flood stages of the river to pass through the gates, thus avoiding overflowing large areas of land that otherwise would be inundated at such times.

The power house is of brick and reinforced concrete construction, 56 ft. long and 22½ ft. inside width. There is one 500-hp. vertical turbine of the Francis type installed and foundations are built for a second unit, to be installed later. The plant has a total development of 1000 hp. Power is transmitted to the water works station about ¾ mile below the dam and used for pumping the water.

The surplus power will be sold as there is a good demand for the power from a number of mills and shops close by. The lake formed by the backing up of the water is about 8 miles in length and will average 500 to 600 ft. in width, with wooded hills on each side of the stream and high bluffs at various points. A most attractive lake has been formed as a recreation spot. This municipal plant is under the charge of Leland C. Angevine, resident engineer.

The Fort Dodge, Iowa, Municipal Dam.

A Unity Power-Factor Motor with Squirrel-Cage Rotor

Motor Has Two-Phase Winding, One Winding Having a Condenser in Series—Operates on Single-Phase Circuits as Self-Starting Motor with Very High Power-Factor

By MILLARD C. SPENCER

ALTHOUGH the fact may not be generally appreciated, it is quite possible to operate an induction motor, with a standard squirrel-cage rotor, on single-phase power, as a unity power-factor motor.

In order to accomplish this result according to the following method, it is necessary that the stator of the motor be wound with an ordinary two-phase winding instead of the usual single-phase winding. These two windings are indicated diagrammatically in Fig. 1 as A and B. Winding A is connected directly across the single-phase line. Winding B is connected in series with a condenser C across the same line.

Such a motor will operate as a balanced two-phase motor, provided the current in winding A lags 45° behind the line electromotive force and the current in winding B leads this emf. by 45°, for there will then be a true two-phase relation between the current in winding A and the current in winding B; that is, the current in winding B will be exactly 90° ahead of the current in winding A. That these two currents will, at the same time, combine to draw power at unity

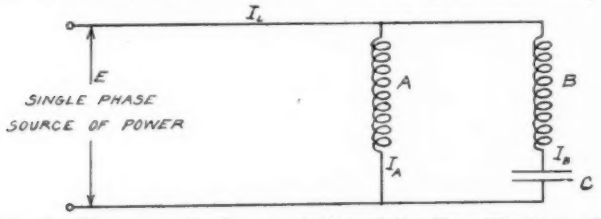


Fig. 1.—Diagrammatic Representation of the Two Windings of Unity Power-Factor Single-Phase Motor.

power-factor from the line may readily be seen from the vector diagram of Fig. 2.

The first condition, that the current in winding A shall lag 45° behind the emf., is readily satisfied because the normal power-factor of a two-phase motor of small size, such as is suited to this method of operation, is about 71%, which means that the current lags about 45° behind the emf., which is exactly what is required.

The size of the condenser C, which it is necessary to connect in series with winding B in order to cause the current in this winding to lead the emf. by 45°, may be determined from the following considerations:

The complete formula for the current in an alternating-current circuit containing resistance, reactance and capacity in series is:

$$I = \frac{E}{\sqrt{R^2 + \left(2\pi fL - \frac{1}{2\pi fC}\right)^2}} \quad \ldots\ldots(1)$$

where I = current in amperes,
E = applied emf. in volts,
R = resistance in ohms,
f = frequency in cycles per second,
L = inductance in henries,
C = capacity in farads.

For winding A, which has no series capacity, this reduces to

$$I = \frac{E}{\sqrt{R^2 + (2\pi fL)^2}} \quad \ldots\ldots(2)$$

where $2\pi fL$ = reactance, in ohms, of winding A, and the plus sign indicates that the current lags behind the emf.

In order that we may have a current of the same value in winding B, but which shall lead the emf. by the same amount as the current in winding A lags behind the emf., it is necessary that the plus sign in formula (2) shall be changed to minus and that the numerical value of the quantity in the parenthesis shall remain the same. Mere inspection of formula (1) shows us that this can be accomplished by simply

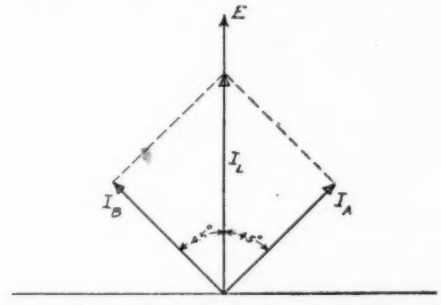


Fig. 2.—Vector Diagram Showing How Current in Winding A Lags and That in Winding B Leads.

selecting a value of capacity C such that the following relation shall be satisfied:

$$\frac{1}{2\pi fC} = 2\,(2\pi fL)$$

that is, the condensive reactance of the condenser connected in series with the winding B should be equal to twice the inductive reactance of this winding.

Test of Motor of This Type.

In order to test out this theory, an ordinary single-phase induction motor was rewound with a two-phase winding. The operating characteristics of this motor with a condenser, of 26 microfarads capacity, connected in series with one winding, are shown in the following table in comparison with the operation of the same motor when wound with an ordinary single-phase winding with a split-phase starting winding.

	Unity Power-Factor Motor.	Split-Phase Motor.
Output	⅛ hp.	⅛ hp.
Line current	1.75 amp.	2.45 amp.
Power-factor	100%	60%
Efficiency	49%	57%
Starting torque	55%	125%
Pull-out torque	240%	215%

The operating characteristics of this motor, with different values of capacity connected in series with one winding, are shown by the curves of Fig. 3.

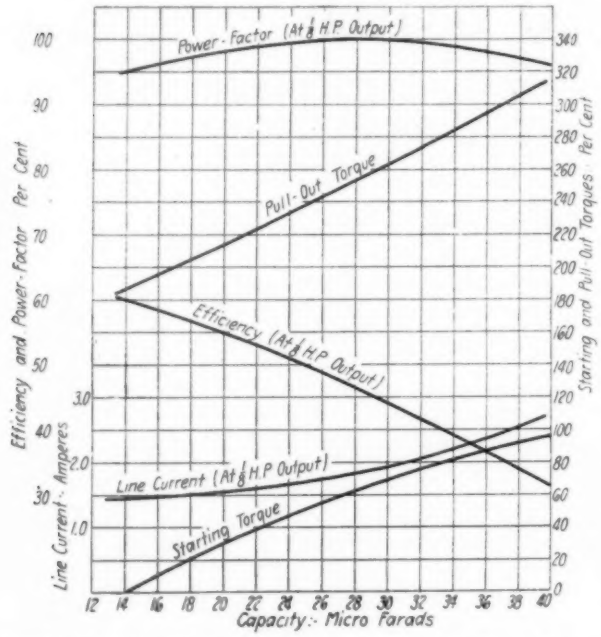

Power-Factor (At ⅛ H.P. Output)
Pull-Out Torque
Efficiency (At ⅛ H.P. Output)
Line Current (At ⅛ H.P. Output)
Starting Torque
Efficiency and Power-Factor Per Cent
Line Current:- Amperes
Starting and Pull-Out Torques Per Cent
Capacity:- Micro Farads

Fig. 3.—Operating Characteristics of ⅛-hp. Unity Power-Factor Single-Phase Induction Motor With Different Values of Capacity in Series With Winding B.

The starting of this unity power-factor motor is, of course, entirely automatic since it requires no auxiliary starting winding or centrifugal switch.

MAKING THE ELECTRIC INDUSTRIAL TRACTOR MORE EFFICIENT.

By G. A. Hughes and R. H. Pool.

It was only in the last three years, during the shortage of labor, that the electric tractor was able to fully demonstrate its important position in the industrial world. It is now as much of a fixture in many industries as the motor trucks or other equipment that is used in the handling of material about a factory and its use should increase rapidly during the next few years in spite of the fact that the labor situation has been greatly relieved.

This development, however, will be greatly accelerated if those interested in the sale of tractors and the present owners of them realize and use them at their highest efficiency. As with practically every other industrial appliance the value of the tractor depends upon the extent of its application and the methods of operation which are employed in its use. Proper care and maintainance of the equipment are, of course, important, but, in addition several other factors must be considered to assure the successful operation of the tractor. Among these other factors are the following; first, the operator; second, the use of attachments which will either increase the use of the tractor or assist in its operation; third, a more universal use of the tractor for odd work around the plant.

A competent operator is essential to success in the application of an industrial electric tractor as the saving and the efficiency of the machine depends entirely upon this person. Cheap labor has too often been the cause of a tractor being condemned or a different make being tried, and found successful with a new operator, while either machine would have been satisfactory under the same operating conditions. In fact, a good operator with a poor tractor, is preferable to a poor operator with a good machine.

Among the many attachments for increasing the efficiency of the tractor none is more desirable than

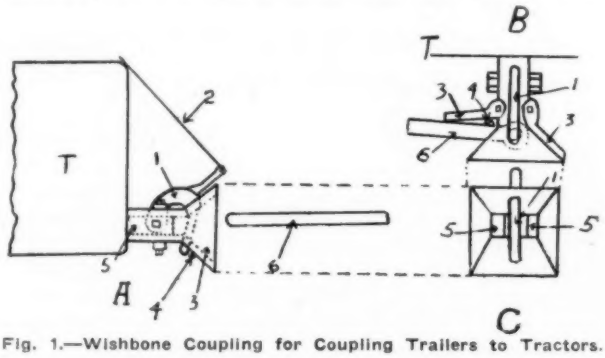


Fig. 1.—Wishbone Coupling for Coupling Trailers to Tractors.

a device by which the trailers may be coupled to the tractor, if possible without the operator being compelled to leave his seat, and without assistance. The couplings shown in the acompanying illustrations have been used with considerable success in many plants.

Fig. 2.—Attachment for Coupling Trailers With Bar Handles.

The device shown in Fig. 1 is what is commonly known as the "wishbone" coupler. In the diagram *A* is a side view of the coupling on tractor, *T*. *I*. is the wishbone pin, which is raised by the cord *2* falling back into the position shown when the cord is released. The sides *3* are movable, so as not to interfere when turning and act as guides in coupling. They are held in place by means of the spring *4*. The stops *5* hold the eye of the trailer handle from keeping the pin *1* from closing; *6* is the handle of the trailer. *B* shows the action in turning and *C* is an end view.

A type of coupling for use with trailers having handles that are not provided with an "eye" is shown

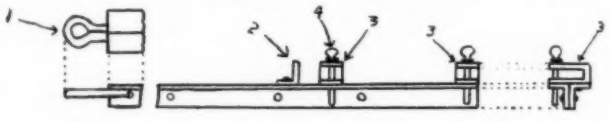


Fig. 3.—Extension Handle for Use Where Overhanging Loads Are Carried.

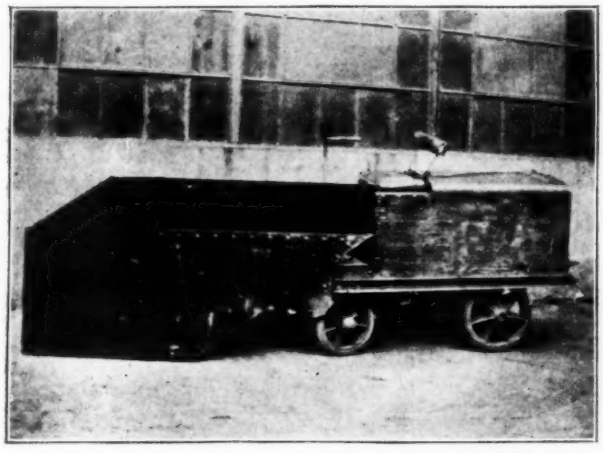
in Fig. 2. It is made from 1-in. round steel and is welded where it is folded back, at points *A*, to make it more rigid.

An extension handle for use where the trailers are loaded with overhanging material and prevents the eye of the handle from engaging the tractor coupling is shown in Fig. 3. The eyebolt *1* shown in the side view slips over the pin *2* shown in the top view. The handle of the trailer slides into the clamps *3* and is held in place by the pin *4*.

The industrial electric tractor is usually consid-

ered only for its use in the cartage of material, but its value has been greatly increased by its application for numerous other purposes. In construction work, for example, it has frequently proven its worth in the erection of structural steel parts. By attaching a fall line from a twist to the tractor, columns and roof trusses are quickly and easily raised into position.

In the loading of logs and telephone poles on flat cars, also the unloading of machinery, such as presses, cranes, motor-generator sets, transformers, structural steel, in fact all kinds of equipment where an electric traveling crane or a steam crane is not available, such as in construction work, the tractor with the aid of



Electric Tractor Equipped With Snow Plow Attachment.

rope blocks is able to do the work of many men and in a shorter time. With the above mentioned equipment the writer has seen machines weighing approximately 60 tons unloaded from cars and moved with ease on 4-in. rollers with a good smooth track for the rollers to work on—the tractor working on a cement floor. In installation work, transformers weighing 4400 lb., motors weighing 5500 lb. and sections of overhead electric traveling cranes weighing 6000 lbs., were raised into place with the aid of a tractor and rope block. A Franklin boiler weighing 27,000 lbs. was dragged into position over the foundation. In this case the track was rough and the rollers were wood, 6 ins. in diameter. The tractor was working on solid clay and it was necessary to weight it down to keep the wheels from slipping, which was accomplished by placing five men on the tractor. The tractor was a Mercury, type X, and was equipped with Edison A-6 cells. This tractor has also been used to advantage in stretching wires ranging in sizes from No. 3 to 500,000 c.m. and in spotting freight cars.

Another use to which tractors have bene successfully applied is in clearing snow from sidewalks and shipping and receiving platforms.

The tractor in this case was equipped with a guard or shield in front made of 3/8-in. steel plate rigidly attached to the machine. To this a snow plow made on the plan of the ordinary farm plow, with the moldboard on the right side was attached. The plow was made from No. 14 gauge sheet steel, braced and reinforced with angles. The bracing was used to fasten it to the tractor, in such a manner that there was no side motion to the plow. A lever is provided so the point can be raised about 18 in. from the ground to permit turning; it was provided with runners 1/4 in. high in front to keep it from digging in and to lift it over the uneven places on the walks.

By wrapping the tractor wheels with chains this outfit was able to clear approximately 23,000 sq. ft. of walks and platforms in six hours. The snow ranged from 10 in. on the level to 30 in. in the drifts and was packed to a slight degree. In this instance the work was started with the batteries fully charged, and after five hours work it was found necessary to give them a boosting charge. This was done during the lunch period. The tractor was also examined at this time and the motor was found to be extremely warm, but not damaged. After the battery was on charge half an hour the tractor completed the work of clearing the walks.

ELECTRIC PUMPS UTILIZED IN HYDRAULIC SLUICING.

Two Pumping Sets at Different Levels to Be Operated Alternately—Economizing Power.

The necessity recently arose for rearranging and enlarging the electric pumping equipment required by the Ochoco Irrigation District at Prineville, Ore. The duty of the pumps there is to furnish about 6,000,000 gal. of water per day for sluicing material required in making a hydraulic-fill dam which is under construction. The electric energy for this work is furnished by the Des Chutes Power Co., of Prineville.

The pumping plant as originally installed on Ochoco creek, consisted of two Worthington 3-stage, 10-in. centrifugal pumps, operating in multiple under a 225-ft. head, with a discharge of 6,000,000 gal. per 24 hours, requiring 450 hp. If the pumps were remodeled and the dismounted impellers replaced the plant could be made to consist of two 5-stage 10-in. pumps, operating under the greater required head of 375 ft., and handling the same volume; but this would require 750 hp. and this was 300 hp. in excess of the power available at the power company's plant. The plan devised for meeting the situation was to install an auxiliary pumping plant at a point midway between the present pumping plant and a proposed new sluicing pit, and to operate the two plants alternately with the power available. This plan also necessitates the construction of a reservoir at the site of the midway pumping plant.

The two Worthington 3-stage, 10-in. pumps of the original plant are being moved to the midway site for installation as auxiliary pumps, and in their place are being installed two D'Olier 12-in. centrifugal pumps, to be driven by an Electric Machinery Co. 400-hp. synchronous motor. The two pumps are connected in parallel so as to deliver 8,000,000 gal. per 24 hours against 185-ft. head, discharging into the new intermediate reservoir. The auxiliary pumps at this reservoir, driven by a Westinghouse 450-hp. motor, will force water from the reservoir direct to the sluicing giants at the pit 150 ft. higher. By operating the D'Olier 8-million-gallon pump on Ochoco creek every other day, and by alternating with the Worthington 6-million-gallon pump at the intermediate reservoir, it will be seen that the reservoir will always contain an ample volume of water for sluicing: and under this arrangement the 450-hp. of available power serves to operate both pumping units.

The moving of the original pumps and the installation of the new unit is being carried out by Thompson & Castleman, electrical engineers and contractors, of Seattle, Wash., and will be completed by April 1, allowing the sluicing and dam construction to go on at the rate of 1530 cu. yd. per day.

CENTRAL STATIONS OF THREE STATES SHOW CONSISTENT GAINS.

Census Bureau Reports for West Virginia, Arkansas and Massachusetts Given Out.

The central-station companies of three more states have made very substantial gains during the last five years according to the preliminary figures of the forthcoming quinquennial report of the Bureau of Census which have just been given out by Director Sam. L. Rogers. The statistics cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc. which generate current for their own consumption; those operated by the Federal Government and state institutions, and those that were idle or in course of construction. In preceding issues of the ELECTRICAL REVIEW the reports of 21 states have been published.

Large increases are shown in substantially all items for both five-year periods covered by the table for West Virgina, but the increases from 1912 to 1917 are actually and relatively much greater than those for the preceding five years. The numbers of stations increased from 58 in 1912 to 72 in 1917. The actual number of new establishments added since 1912 was 26, of which 24 were commercial and 2 municipal; but, as the result of a number of combinations in the commercial systems and changes in ownership, etc., an increase of only 14 establishments, 11 of which are commercial, is shown by the figures. Although steam supplied the greater part of the horsepower at each of the three censuses for which figures are given, there was a great proportionate gain in the power derived from internal-combustion engines: from 925 hp. in 1907 to 3085 in 1912 and to 10,100 in 1917.

CENTRAL-STATION STATISTICS FOR WEST VIRGINIA.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	72	58	48	.....	.....
Commercial	63	52	43	.....	.....
Municipal	9	6	5	.....	.....
Income[2]	$3,583,492	$1,167,583	$724,253	394.8	206.9
Electric service	$3,508,995	$1,148,089	$689,919	408.6	205.6
All other	$74,497	$19,494	$34,334	117.0	282.2
Total expenses, including salaries and wages	$2,975,345	$897,843	$534,365	456.8	231.4
Number of persons employed	753	439	262	187.4	71.5
Salaries and wages	$675,121	$255,471	$168,633	300.3	164.3
Total hp.	130,693	43,185	21,428	509.9	202.6
Steam engines:					
Number	84	88	75	.....	.....
Hp.	114,094	34,064	16,876	576.1	234.9
Internal combustion engines:					
Number	32	24	9	.....	.....
Hp.	10,100	3,085	925	991.9	227.4
Water wheels:					
Number	15	14	11	.....	.....
Hp.	6,499	6,036	3,627	79.2	7.7
Kw. capacity of dynamos	103,611	29,772	14,726	603.6	248.0
Output of stations, kw-hr.	204,107,945	42,344,796	24,871,317	720.7	382.0
Stationary motors served:					
Number	3,883	1,279	340	1042.1	203.6
Hp.	98,573	22,925	4,432	2124.1	330.0
Number of street lamps:					
Arc	2,151	2,096	[3]	.....	2.6
Incandescent, etc.	5,996	2,922	[3]	.....	105.2

[1]A minus sign (—) denotes decrease. Percentages omitted where base is less than 100. [2]Exclusive of $713,008 in 1917 and $386,598 in 1912, reported by electric railway companies as income from sale of electric current. [3]Not available.

The number of stations reporting from Arkansas increased from 74 in 1912 to 96 in 1917. The actual number of new establishments added since 1912, however, was 43, of which 38 were commercial and 5 municipal; but, as the result of a number of combinations in the commercial systems and various other changes, a net increase of only 22 establishments, 15 of which are commercial, is shown by the figures.

CENTRAL-STATION STATISTICS FOR ARKANSAS.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	96	74	63	.....	.....
Commercial	71	56	50	.....	.....
Municipal	25	18	13	.....	.....
Income[2]	$1,301,889	$1,053,763	$ 675,718	166.7	71.0
Electric service	$1,737,999	$1,016,664	$ 664,916	161.4	71.0
All other	$ 63,890	$ 37,099	$ 10,802	491.5	72.2
Total expenses, including salaries and wages	$1,450,358	$ 749,029	$ 491,871	194.9	93.6
Number of persons employed	459	360	244	88.1	27.5
Salaries and wages	$ 338,417	$ 242,267	$ 157,814	114.4	39.7
Total hp.	36,599	25,860	13,953	162.3	41.5
Steam engines:					
Number	130	115	98	.....	13.0
Hp.	31,498	22,599	13,641	130.9	39 4
Internal-combustion engines:					
Number	44	5	1	.....	.....
Hp.	2,561	221	12	.....	1058.8
Water wheels:					
Number	10	10	1	.....	.....
Hp.	2,540	3,040	300	746.7	—16.4
Kilowatt capacity of dynamos	24,913	16,335	9,678	157.4	52.5
Output of stations, kw-hr.	38,644,801	17,786,660	11,519,316	235.5	117.3
Stationary motors served:					
Number	1,112	994	198	461.6	11.9
Hp.	11,533	5,283	1,177	879.9	118.3
Number of street lamps:					
Arc	1,138	1,045	[3]	.....	8.9
Incandescent, etc.	9,302	4,731	[3]	.....	96.6

[1]A minus sign (—) denotes decrease; percentages omitted where base is less than 100. [2]Exclusive of $653,592 in 1917 and $612,953 in 1912, reported by street and electric railway companies as income from sale of electric current. [3]Not available.

The generally large increases for Massachusetts from 1907 to 1912 continued for the five-year period 1912 to 1917. There was a pronounced increase in water power, from 24,480 hp. in 1912 to 118,986 hp. in 1917, or 386.1%. Notwithstanding this gain, steam is the predominant power used in the electric stations of the state, although its proportion of the total power decreased from 92.1% in 1912 to 81.6% in 1917. The capacity of the dynamos increased from 252,732 kw. in 1912 to 478,933 kw. in 1917, or 89.5%, compared with a gain of 85.9% from 1907 to 1912. There was a slight decrease in the number of arc street lamps, from 17,601 in 1912 to 16,375 in 1917, or 7%, while the incandescent street lamps increased from 67,372 to 100,394, or 49%, during the same five-year period.

CENTRAL-STATION STATISTICS FOR MASSACHUSETTS.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1917.	1912 to 1917.
Number of establishments	120	117	120	.....	2.6
Commercial	81	87	96	—15.6	—6.9
Municipal	39	30	24	62.5	30.0
Income[2]	$30,392,893	$16,306,909	$10,749,240	182.7	86.4
Electric service	$29,636,879	$15,996,463	$10,602,498	179.5	85.3
All other	$ 756,014	$ 310,446	$ 146,742	415.2	143.5
Total expenses, including salaries and wages	$23,577,844	$11,651,739	$ 7,065,197	233.7	102.4
Number of persons employed	5,482	3,954	2,672	105.2	38.6
Salaries and wages	$ 4,557,883	$ 2,981,043	$ 2,235,647	103.9	52.9
Total hp.	680,485	350,780	188,335	261.3	94.0
Steam engines:					
Number	239	270	323	—26.0	—11.5
Hp.	555,212	323,128	170,457	225.7	71.8
Internal-combustion engines:					
Number	24	22	12	100.0	9.1
Hp.	6,287	3,172	1,097	473.1	98.2
Water wheels:					
Number	78	58	58	34.5	34.5
Hp.	118,986	24,480	16,781	609.0	386.1
Kilowatt capacity of dynamos	478,933	252,732	135,924	252.4	89.5
Output of stations, kw.hr.	937,124,653	386,254,294	219,425,607	327.1	142.6
Stationary motors served:					
Number	65,218	37,191	15,877	310.8	75.4
Hp.	446,025	228,868	81,246	449.0	94.9
Number of street lamps:					
Arc	16,375	17,601	[3]	.....	—7.0
Incandescent, etc	100,394	67,372	[3]	.....	49.0

[1]A minus sign (—) denotes decrease. [2]Exclusive of $578,283 in 1917 and $396,124 in 1912, reported by street and electric railway companies as income from sale of electric current. [3]Not available.

HOW ONE AMERICAN COMPANY COMBATS GERMAN DEVASTATION.

Western Electric Co.'s Antwerp Plant Will Soon Be in Operation Again.

Despite the subjugation of the German military forces, the systematic pillaging of factories in Belgium and Northern France, has created a situation that may enable the Germans, even in the midst of military defeat, to gain in the field of peaceful industry a considerable advantage over their victorious opponents. Just how great this danger is, still remains a subject for speculation, even among experts, but the story of the reconstruction of the Antwerp branch of the Western Electric Co. shows that it is possible to balk the German scheme.

The Antwerp house was the first of this company's factories in Europe, and from its establishment, in 1882, to the capture of Antwerp by the Germans in the fall of 1914, played a leading role in the development of the company's European business. It had increased from a small building to a considerable group, and the telephones, switchboards and other electrical apparatus made there could be found in all parts of the world.

After the city of Antwerp was occupied by the German army, in company with a large proportion of the population, the men in charge of the Antwerp house made their way to Holland, but five days later, when conditions had become more settled, C. C. Clayton and A. D. Whipple, both Americans, returned and remained there for nearly three years, when the entrance of America into the war made it necessary for them to leave.

When the entrance of the United States into the war seemed likely, Mr. Clayton decided that it would be an excellent plan to conceal the records and other valuable papers of the branch from the Germans. He and Mr. Brodahl, the factory engineer, who since has died, went through the files in the offices of the men who had been in active charge of affairs, and removed everything that might be of profit to the Germans. These papers, with various other articles, were then placed in zinc boxes and the boxes were buried under the floor of the room and the floor and earth carefully replaced to prevent the discovery of the hiding place.

Even before the records had been buried, the first step in another phase of the reconstruction process had been taken. Anticipating what later proved to be a fact—that the Germans would carry off most of the machinery—a list of all the machinery in the Antwerp factory was drawn up and smuggled out of Belgium. This list, written on extremely thin paper that could be folded into an almost infinitesimal compass, was sent to America, where it was found that most of the needed equipment could be replaced from the surplus stock of the company's Hawthorne plant near Chicago, Ill. Arrangements were made long ago to ship the machinery as soon as it was discovered how much would be required.

All this, of course, went on while the war was still in progress, and the Germans were taking machinery from almost every factory in Belgium and Northern France, and transporting it to Germany for use while Belgium would be devastated.

For the last three months of the war the factory was in active use by the Germans for the purpose of repairing field telephones and work of a kindred character. Not all of the buildings were so used, however, and the idle portions were filled with the furniture and some of the machinery removed from the rooms the Germans occupied.

The phrase, "some of the machinery," is used advisedly, because the Germans carried off most of it to Germany. The new turbine unit installed not long before the war began was ripped from its concrete base. The remainder of the old power plant is still in place, however. It consists of two vertical compound engines, with Western Electric generators and one horizontal engine. Three of the four boilers are in good condition, except that the automatic stoker on one of the boilers is among the missing. There was precious little machinery of value to the Germans overlooked by them. All stock of raw material, including lumber, had also disappeared.

The buildings, however, are in even better condition than was anticipated. Practically all of the electric light wiring is intact. The records, platinum and tools were found undisturbed and unharmed by their sojourn of three years underground. The haste with which the Germans left caused a sort of involuntary exchange of machinery, because much of that which they had brought from Germany and installed for their signal corps repair work, was left behind. Some of it was all packed and crated, ready to be taken back. Considerable stocks of war material, such as field cables, portable sets, magneto apparatus, switchboards, batteries, condensers, etc., also were abandoned.

Now for the future. How long is it going to take to prove to the Germans that their attempt to cripple the business for years to come was as useless as their attempt to whip the world? It takes two things to run an establishment like the Antwerp factory—machines and men. The survey of the machinery situation, made while the war was still raging, already has been mentioned, so it is almost superfluous to add that even now the machines are on their way to Antwerp. By this time some of this machinery probably is already installed. Ten carloads left the Hawthorne branch some time ago, and so important was the shipment considered that Herbert C. Hoover gave permission to include them in the cargo of one of the steamers of the Belgian Relief Commission.

As the machines are so much useless metal without men to run them, and the executive forces to direct the work, the reconstruction of the organization has not been overlooked. After the fall of Antwerp, the executives of the factory were assigned to other posts in the company's organization. Some stayed in Holland, others went to Paris and London, and a fair-sized delegation came to the United States. Now most of them are hurrying back from Hawthorne and New York, from London and Paris to take up their work once more, so hurriedly relinquished.

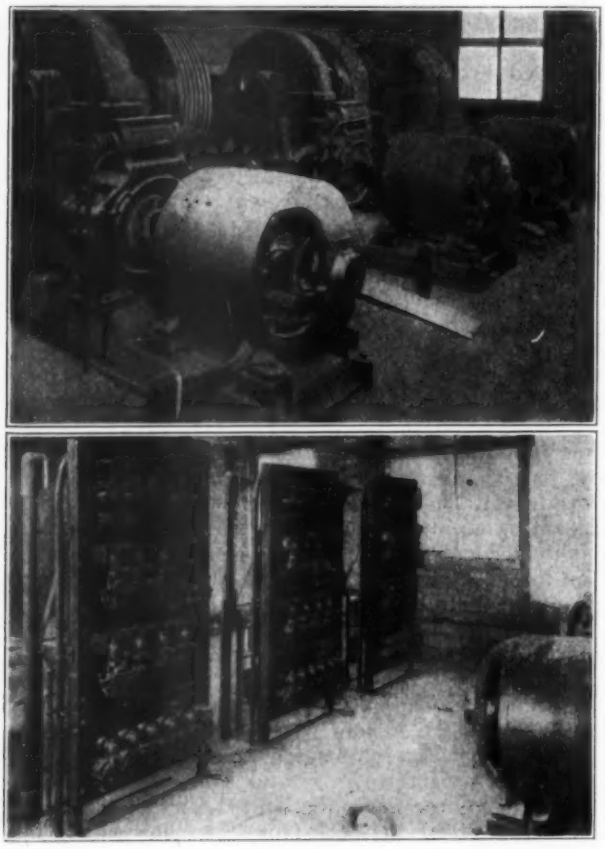
Of course, a big proportion of the Belgians employed went at once into the Belgian army, and many of that gallant body of fighters never will return. The Belgian government is doing all that it can to accelerate the rehabilitation of industry by releasing at an early date the "keymen," as they are called—men such as foremen, who are essential to the industries in which they were engaged before the outbreak of hostilities. The other workmen also are coming back as fast as they are discharged from the army, and it is estimated that approximately 60% of the former employes will return. There were about 2300 of them in the old days. Within six months, it is expected the Antwerp factory will be running on a considerable scale, is the prophecy made at this time by the company's executives.

ELECTRIC ELEVATOR EQUIPMENT FOR MILWAUKEE ATHLETIC CLUB.

Unique Features of Elevator Machines, Motors and Controllers—Excellent Operation Secured.

The new Milwaukee Athletic Club building which was opened to its members during the past summer, is one of the most modern and completely equipped club buildings of its kind. The new club house, which cost nearly $1,000,000, stands on a plot of ground 120 by 120 ft. It has 12 stories, is 175 ft. in height, and is constructed almost wholly of steel and concrete. Included in its appointments are two swimming pools for men and women, gymnasiums, handball courts, bowling alleys, billiard rooms, besides all the accessories of a first-class hotel.

Among the many conveniences installed in the



Single-Gear, V-Groove, Traction Type Passenger Elevator Equipment in Milwaukee Athletic Club House—Three Elevator Machines and Driving Motors Show Above—Automatic Controllers for Each Motor Below.

building are three electric high-speed passenger elevators and a similar one called a service elevator and one slow-speed freight elevator. The type of elevator machine installed is the single-gear V-groove traction, which has not been extensively used in this country until just recently, although a number have been built for export business. The accompanying illustration shows the three passenger elevator machines.

The machines were built by the Haughton Elevator Co., Toledo, Ohio. The motors are 35-hp., 230-volt, 250 to 750 r.p.m., shunt-wound, made by Roth Brothers & Co., Chicago, and built in accordance with a combined design of this company and the Cutler-Hammer Manufacturing Co., Milwaukee, the latter company also furnishing the controllers. From the specifications of the motor given above, it can be seen that there is a 3 to 1 speed control; this is accomplished by shunt-field weakening, which gives an economical running condition with each speed except slowdown, and this is used only in making landings. There are three speeds that can be secured from the car switch.

The slow speed (45 to 50 ft. per minute) corresponds to the motor speed with full field and a resistance in series with the armature, and a resistance shunt across the armature.

The normal speed (150 ft. per minute) is secured with all of the armature resistance cut out and with the armature shunt open-circuited.

The high speed (450 ft. per minute) corresponds to the motor speeded up through field weakening.

A noticeable feature in the operation of the elevator is the uniform rate of the acceleration and retardation, secured through the controllers.

Each controller has a single-pole magnetic type service switch which remains closed during the hours the elevator is in service. By means of a pilot switch in the car the service switch may be opened when the elevator equipment is to be shut down for any appreciable period, thus disconnecting the motor entirely from the line and eliminating power consumption in the shunt field, which occurs as long as the elevator is in service. The two middle panels of each controller carry a double-pole magnetic main switch and two double-pole reversing switches, also control fuses with metal covers and a tryout switch. By means of this tryout switch the car may be operated from the switchboard without the use of an operator. The lower panel contains the armature accelerating switches, which consist of a magnet relay retarded by an air dashpot and five magnetic accelerating switches. The slowdown is accomplished by means of two switches, one of which is spring-closed and which connects a resistance across the motor armature at the same time the armature accelerating resistance is inserted. After this initial dynamic braking has died down, the second switch, which is a magnetic lockout switch, closes, thus giving another inrush of current and slowing down the car still more. A single-pole magnetic switch is also provided to give full field strength to the motor during the dynamic braking period. The field control consists of four single-pole spring-closed contactors which open in succession and which insert resistance in the shunt-field circuit. A double-coil overload relay is also provided on the top panel, which may be reset by moving the car switch to the neutral position.

The passenger elevators have a capacity of 2250 lb. at 450 ft. per min. The freight elevator has a capacity of 2250 lb. at 250 ft. per min., and is equipped with a 25-hp., 230-volt, 450 to 900 r.p.m. compound Roth motor. The control is similar to that of the passenger and service elevators with the exception that there are fewer refinements because of slower speed. Each elevator machine is equipped with two brakes, one a drum brake, and the other a motor brake, both of which are operated by electromagnets. The control equipment is so arranged that the drum brake applies a moment before the motor brake, as this arrangement gives a smoother stop.

A well-known engineer who has specialized in this work made the remark that these elevators were the smoothest running elevators he had ever ridden in, and that if he had not been told they were geared machines he would have believed they were 1 to 1 gearless traction elevators, considered the smoothest operating machines, but are more expensive.

Editorial Comment

What Further Delay in Water-Power Development Means

BY TAKING advantage of the undemocratic and non-progressive rules of the United States Senate, a handful of members of that highly privileged body has deliberately prevented enactment before the final adjournment of Congress of numerous measures of the highest importance to the country. At a very critical time in the history of the nation and of the world, when all eyes were turned toward the capital eagerly awaiting the framing of constructive legislation, they beheld instead the spectacle of a small group of obstructionists for reasons of partisanship or expediency, holding up the wheels of government—a sight to inspire such radicals as anarchists and bolshevists.

Many valuable months have thus been wantonly lost that could have been usefully employed in accelerating the readjustment to peace conditions and in furnishing additional means of employment to returning soldiers and sailors and the industrial army now increasingly idle. Of the many beneficent measures that died with the late Congress on March 4 was one setting apart funds to put into effect Secretary Lane's soldiers' land settlement scheme. Another was the water-power bill, which it was hoped would aid mateially in the development of the country's sadly neglected water-power resources. The failure of this bill was especially unfortunate in that it represented something like seven years' efforts to secure national legislation on this subject. In its final form the bill was a compromise measure developed during conference between the two houses. Like most compromises it had many defects but it was at least clear and would have served to define the Government's attitude so that actual development could be undertaken with conditions known. The House had approved the conference report and it remained only for the Senate to do so likewise, which action there seemed every reason to believe it would take before adjournment. With the advent of a new Congress the work will have to be not only all gone over again, but may involve new delays of indefinite extent.

Meanwhile, the streams and falls of the mountains and the rivers of our plains are continuing their steady flow to the seas as they have more or less peacefully done for thousands of years without delivering up any of their energy of flow except in constant erosion of their channels and in widespread destruction in their valleys at times of occasional flood. Ordinary citizens and even members of Congress have little conception of the meaning of a statement that millions of horsepower of potential energy is constantly going to waste in our water falls, rapids and swiftly flowing streams.

However, during the severe winter of a year ago we experienced an unprecedented shortage of fuel and of power. It has been pointed out that for every horsepower continuously developed from water power for each month, there would be saved, as compared with the consumption of average steam power plants nearly two tons of coal. This means that each 50,000-hp. hydroelectric plant operating steadily throughout a year would save about 1,000,000 tons of coal.

In many sections of the country oil is used as fuel. A statement has just been issued by the Geological Survey that our total oil resources have been exhausted to something like 40%. The rate of consumption of both coal and oil has steadily increased and no doubt will continue to increase. Natural gas has already been exhausted in many of the old gas fields. Shall we trust to luck in finding new sources of heat and power when the present fuels are reaching the point of exhaustion, or shall we without further delay proceed to develop at least one known and practical source of power which is now an absolute waste?

From the industrial standpoint the development of water power is of the greatest importance. Not only should we seek to secure the cheapest kind of power in order that our industries may be operated as efficiently as possible and thus meet foreign competition under the most favorable circumstances, but many industries already developed can continue only if their power supply is obtained at the lowest possible cost. Among these industries is the electrochemical, which already has been forced in large measure to seek more favorable conditions in Canada, where the utilization of water power is recognized as the wisest conservation.

That country is a splendid example of how to proceed with actual water-power development instead of endlessly talking about it. On other pages of this issue we give a condensed summary of a central-station survey of Canada, in which it is strikingly shown that about 85% of its electric power is developed from water-power resources. During the over four years of violent warfare in which that country took a much more active part in comparison with its resources than we did, this hydroelectric power proved of untold value, and during that time further development of water power occurred. We, on the contrary, have been sitting back and debating as to how water power should be developed and whether it was worth while doing anything about it at all.

Let the new Congress take prompt and definite action on this matter, therefore, so that we may see at least as much development of hydroelectric power as has been effected by our progressive neighbor.

Making the Most of Daylight Saving

NOW that Congress has adjourned without the daylight saving act being repealed, central-station interest turns, not upon saving the extra hour of daylight, but to the practical question of utilizing it and all it implies most usefully.

With the coming of the additional hour of daylight disappears a portion of the evening peak in the load due to overlapping of the dwindling power load and the oncoming lighting load. This means, of course, that system operation tends to be somewhat more economical during the time that this daylight saving period is effective. But it means also that generating, transmission and distribution apparatus is available for uses other than that of carrying a peak for a short period of time.

Summer service, by which is meant the taking over by central stations during summer months of loads carried by isolated plants during the major portion of the year, made rapid headway in the Middle West and East during the times of actual and threatened coal shortage last year. In most cases where the isolated plants went over to utility supply during the summer months, they not only saved coal by so doing, but they saved money also. In other words the gain was mutual, of profit to utility and isolated plants. Being so, summer service may be expected to find increasing popularity during the coming summer, making up, if not more than making up, for the loss resulting from the extra 210 hours of daylight.

For many isolated plants obtaining summer service from the central station until such time as climatic conditions necessitate producing exhaust steam, hot water and heat, must remain merely a seasonal proposition. On the other hand there are many isolated plants where the introduction of summer service has proved so economical, convenient and altogether satisfactory that it has become an all-the-year-round service. And the isolated plant has shut down. There are, as we have so often emphasized before, isolated plants where to shut them down and utilize central-station service exclusively would be an economic crime. But, too, there are many more isolated plants where central-station supply entirely would prove the most judicious choice. For such as these the summer service will, it is hoped, prove the thin edge of the wedge so far as obtaining these loads eventually for the entire year is concerned. The experience of many plants in the past has proved that the saving incident to the use of utility service during the 210 days during which the daylight saving is in effect is worth extending to cover the 365 days in the year.

Taking over the "summer service" loads is important. But it is also important to take on other forms of load that the absence or reduction of the evening peak permits. These loads are the loads of high load-factor, such as ice plants, electrolytic plants for the production of chlorine, oxygen, etc., and the electric furnace. For most central-station companies the extra hour of daylight makes available apparatus. The problem of every company is, therefore, to find a way of using this equipment most usefully.

The "Buy It Now" Campaign

GOVERNMENT officials and business men of the country are joining in a nation-wide "buy it now" campaign to stimulate business activity until such time as our reconstruction problems are definitely settled. The movement is of considerable import and is deserving of the support of every American, both from the standpoint of business and private activity.

The statement of Hon. Grosvenor B. Clarkson, director of the U. S. Council of National Defense, sums up the situation as follows:

"The U. S. Council of National Defense, composed of the Secretaries of War, Navy, Interior, Agriculture, Commerce and Labor, has begun a nation-wide campaign urging the people of the country to buy only what they need, but to *buy it now*.

"The Council's action is based on the general industrial situation. In the northern states unemployment is present because of suspension of outdoor work. Workers on outdoor improvements have crowded into the congested cities and are finding more or less difficulty in getting temporary employment. There is business hesitation normal to post-war readjustment. Prices are to some extent declining. Men hesitate to buy materials and supplies on a falling market. This means stopping work in some places and reducing amount of work done in others. Return of soldiers in quantities adds for the time to the problem.

"Without expressing undue alarm, the Council of National Defense believes that the situation invites the activities of certain restless elements of society. The bolshevist takes advantage of idleness. Empty stomachs and purses create his opportunity. His fellow, the I. W. W. agitator, seizes the same occasion.

"There is a great volume of business waiting to be done in America. Private stocks of all kinds are low. The country's means are ample and when the full flow of private buying begins, there will be business for all. But it may take several months to bring this about, and action is needed now.

"Our commerce rests upon the personal purchases of individuals. If all were to stop buying there would be no business. It is called good business to delay buying until the market reaches bottom. If economic law alone were now concerned that would be right action. But there is directly involved at this moment the saving of men from unemployment and the social consequences to them and to the country.

"There must be no waste. We must still save. Taxes are coming and there will soon be another loan. The middle course that the Council urges is: Buy only what you need, but *buy it now*. If this course is followed commercial springs of action will be tapped and a real danger averted."

Week's Events

Plans for N. E. L. A. Exhibit—Electrical Interests Combine to Increase Vacuum Cleaner Business—Electrical Exports

ARRANGEMENTS BEING MADE FOR EXHIBITION AT N. E. L. A. CONVENTION.

Many Exhibitors Asking for More Space Than Was Assigned for the Proposed 1917 Exhibition.

In our recent announcement of the annual convention of the National Electric Light Association to be held in Atlantic City, N. J., during the week of May 19, it was stated that the manufacturers' exhibition will be an important feature of the convention. It is interesting to note that almost all the manufacturers who were assigned space in 1917 have not only sent their acceptance for a reassignment of the same space, but in many cases have asked from the Exhibition Committee increased space to show their new lines or to care for the new conditions that have come up during the last two years.

The committee states this will mean either a change in the space as laid out in 1917 or increased space, or both; consequently, the committee wants to urge the manufacturers who intend making exhibits and who have not already applied for space, to do so at once, giving details as to the amount of space required and as to what they intend exhibiting, so that some arrangement can be made to meet the new conditions and give all the manufacturers who desire an opportunity to exhibit this year at Atlantic City.

H. G. McConnaughy, secretary of the Exhibition Committee, can be reached at 1111 Munsey Building, Washington, D. C., or at 29 West Thirty-ninth street, New York City.

ELECTRICAL INTERESTS COMBINE TO INCREASE VACUUM CLEANER BUSINESS.

Frantz Premier, General Electric and Edison Electric Appliance Companies Form Big Corporation.

Negotiations have recently been completed by the Frantz Premier Co., of Cleveland, the largest manufacturer of electric vacuum cleaners in the United States, with the General Electric Co., of Schenectady, N. Y., and the Edison Electric Appliance Co., Chicago, a subsidiary of the latter company, for the formation of the General Vacuum Cleaners Corporation. It is expected that the new combination will effect a material increase in the output of vacuum cleaners.

The new corporation has an authorized capital of $10,000,000 and the controlling interest will be held by the Frantz Premier Co. A liberal portion of the balance will be held by the General Electric Co. and the Edison Electric Appliance Co. will also receive an interest in return for its vacuum cleaner business. Julius Tuteur, president of the Frantz Premier Co., will be president of the new corporation. Associated with him will be eight directors, five of whom will be elected by the Frantz Premier Co. Headquarters of the new company will be in Cleveland and the operations will be carried on at the present factory of the Frantz Premier Co. in that city.

In discussing the new company, officials stated that the vacuum cleaner business was still in its infancy and that a large domestic trade would be developed rapidly. In addition to this business is the demand from abroad. As soon as export conditions are restored to normal, this outlet will further increase the output of Premier cleaners.

Plans for an extensive advertising campaign are already in progress. Experienced merchandisers of electrical appliances for household use are developing sales and co-operative plans as the foundation of the valuable assistance they propose to render retail merchants.

Dealerships are now being allotted by the Cleveland office and the 1919 business is reported to be well under way.

ELECTRICAL EXPORTS IN 1918 BREAK ALL RECORDS.

Total Value of Shipments Was Nearly Sixty Million Dollars—December Figures Well Up to Average.

A new yearly record in the value of electrical exports from the United States was established by the figures for 1918 just made public by the Bureau of Foreign and Domestic Commerce, Washington, D. C. The total value of electrical shipments was nearly $60,000,000, or about 8% greater than in 1917. The comparative figures are included in the table below, which also gives the data for December, made public at the same time. The December figures were practically equal to the average of the year.

	December		Calendar Year	
Articles.	1918.	1917.	1918.	1917.
Batteries	$ 233,321	$ 370,486	$ 3,178,437	$ 3,624,222
Carbons	139,347	178,567	1,600,920	*736,717
Dynamos or generators	344,034	138,450	3,363,349	2,356,780
Fans	86,678	73,106	847,327	622,731
Heating and cooking apparatus	74,794	58,701	686,339	1,256,533
Insulated wires and cables	465,688	676,651	5,604,114	7,187,951
Interior wiring supplies, including fixtures	100,270	134,398	1,428,615	1,405,772
Lamps—				
Arc	128	1,534	14,139	16,418
Carbon-filament	13,809	27,172	102,872	187,876
Metal-filament	229,903	341,086	3,369,192	2,884,675
Magnetos, spark plugs, etc.	318,005	328,527	2,749,705	*1,757,848
Meters and measuring instruments	122,311	191,539	1,887,925	1,213,278
Motors	663,216	730,585	8,225,197	6,484,972
Rheostats and controllers	27,850	21,641	288,757	*93,612
Switches and accessories	151,786	221,022	2,195,300	*1,025,003
Telegraph apparatus, including wireless	68,090	44,644	378,806	555,703
Telephones	121,935	278,162	2,687,483	2,212,237
Transformers	195,180	213,243	3,528,673	1,747,884
All other	1,829,636	1,696,862	17,845,376	21,107,867
Total	$5,187,981	$5,726,376	$59,982,526	$55,478,079

*Figures cover 6 months, beginning July 1.

In the following table are given the monthly totals

for the 12 months of 1918, which show how the export movement fluctuated during the year.

Months of 1918.	Electrical exports.
January	$4,656,611
February	3,446,801
March	5,147,921
April	4,572,953
May	5,013,379
June	5,019,519
July	5,393,949
August	5,340,110
September	5,146,077
October	4,860,392
November	6,177,252
December	5,187,981

The following table gives the yearly totals since 1912.

Calendar years.	Electrical exports.
1912	$23,212,813
1913	28,197,363
1914	19,963,115
1915	24,308,510
1916	40,244,075
1917	55,478,079
1918	59,982,526

CENTRAL STATION VAUDEVILLE SHOW OF COMMONWEALTH EDISON CO. BIG SUCCESS.

Pre-war Activities Beginning to Come Again in Chicago.

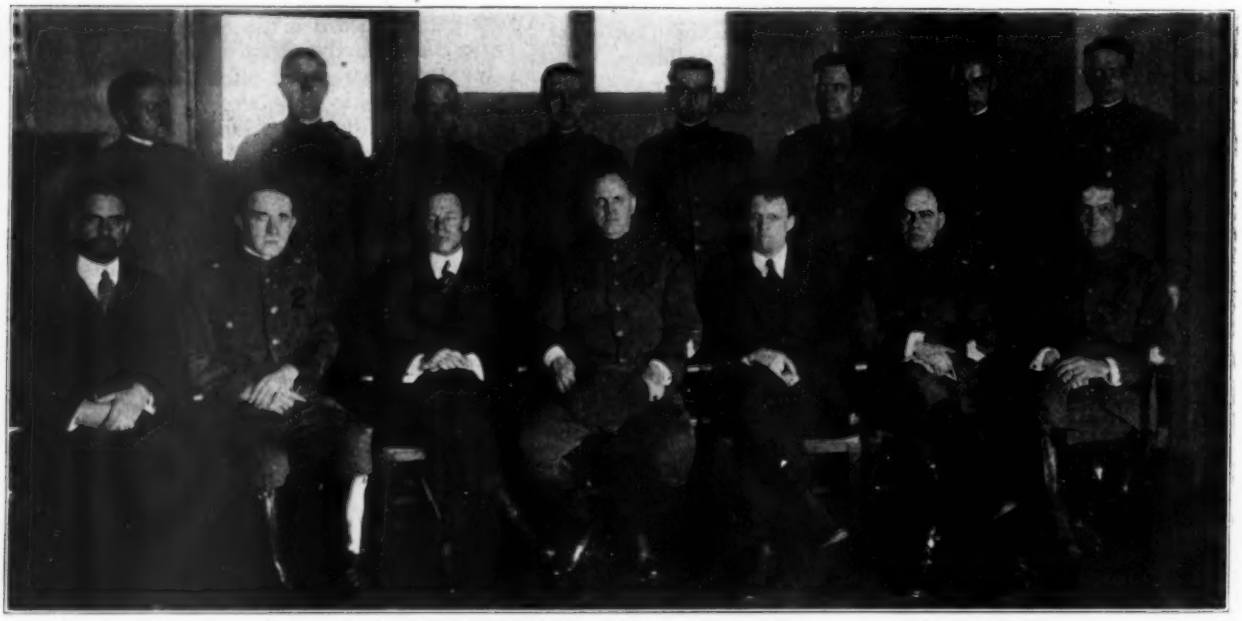
The Commonwealth Edison Co. section of the N. E. L. A. recently gave a vaudeville entertainment which was billed as "amateur night." This is the first entertainment given by this company section since the war. Before the war necessitated economy, and attention to the waging of war, the Commonwealth Edison Co. section of the N. E. L. A. was one of the most active of the company sections of the association, also one of the largest.

Now that conditions are beginning to become more normal, that is, are approaching conditions of pre-war days, N. E. L. A. company sections throughout the country are beginning to again get into the stride of enthusiasm and work and active participation in technical and social affairs.

ELEVATED DOUBLE-TRACK ELECTRIC ROAD FOR SEATTLE.

The city of Seattle has well along toward completion a new electric railway, three miles in length, from First avenue and Washington street in a southerly direction to West Waterway bridge, destined to serve the shipyards and industrial plants on the Tide Flats. About 2½ miles of the line has elevated tracks, 25 to 30 ft. above street level, giving a clearance of 9 ft. over the numerous railroad crossings, the last half mile of the 3-mile line being a surface road. The elevated portion of the structure is supported by wooden piles driven 17 to 20 ft. in soft ground, the maximum pile load being computed at 12 tons. It is a double-track line of 60-lb. rails. The poles on each side are fastened to the piling, with a span wire extending across from the tops of each set of poles, supporting the trolley lines, which are of 00 copper. There are eight stations on the line. The plan is to connect this road at West Waterway bridge with the Lake Burian interurban which reaches beyond the city limits. Thus far, about $320,000 has been expended on this road, and an additional $50,000 may be required to complete it.

War Claims Board that Is Adjusting War Contracts



The War Claims Board, of Which Assistant Secretary of War Benedict Crowell Is President.—Members: (1) Mr. G. H. Dorr, (2) Brig. Gen. Geo. W. Burr, (3) Mr. Benedict Crowell, (4) Brig. Gen. H. M. Lord, (5) Mr. Wm. H. Davis, (6) Lieut. Col. H. H. Lehman, (7) Col. C. A. McKenney, (8) Maj. F. G. Bolles, (9) Maj. H. D. Rawson, (11) Maj. E. Baines, (12) Maj. H. L. Goodhart, (13) Capt. Arthur Day.—Associate Members: (10) Maj. Leigh Keith, (14) Capt. R. D. Stephens, (15) Lieut. B. R. Wellington.

Soon after the signing of the armistice steps were taken by the War Department to cancel war contracts and since that time the department has suspended operations that would have cost $5,829,000,000 to complete. About 19,000 separate contracts had to be adjusted and of these over 4600 have been settled.

Commercial Practice

Newspaper Campaign—Lighting Costs—Dead Services—Customer Ownership in Utilities — Lamp Performance

LETTING THE NEWSPAPERS TELL THE TALE.

More Electric Talks of the Dayton Company From Local Papers.

Taking the public into its confidence has become a policy with the wide-awake central-station company, in fact, all utilities are now realizing that the better the understanding between utility and public the better it is for both. In the ELECTRICAL REVIEW, issue of March 1, appeared on page 355, nine of a series of twelve advertisements that had appeared in the local newspapers of the Wilmington district, Ohio, the series being entitled, "Electric Talks." These talks, that aimed to bring customer and utility closer together, were gotten up by the Dayton (Ohio) Power and Light Co.

The nine advertisements or "talks" appearing in the last issue of the ELECTRICAL REVIEW were entitled respectively, "Introduction," "Use Electric Service," "Expert Advice," "Becoming a Customer,' "Interruptions to Service," "Complaints," "The Public Be Pleased,' "Growth and Prosperity," "Rates." The three illustrations here shown, being the last three electric talks of the series, deal with "Customer Ownership,' "Co-operation," and "Wilmington's Electrical Resources."

The nine advertisements or "talks" appearing in whether or not it paid for the utility to keep in touch with their customers through the medium of the local newspapers. There is no argument as to whether or not it is a good policy to take the public into the confidence of the utility. The better the understanding, the closer the co-operation, the greater the mutual advantage of those that serve and those that are served And while good service is all-important in accomplishing the good feeling, advertising helps to attract attention and bring appreciation not alone from customers but the general public as well.

DATA SHOWING REDUCTION IN COST OF LIGHTING.

Electric Light Less Than One-Twentieth as Costly as Candle Light Used to Be.

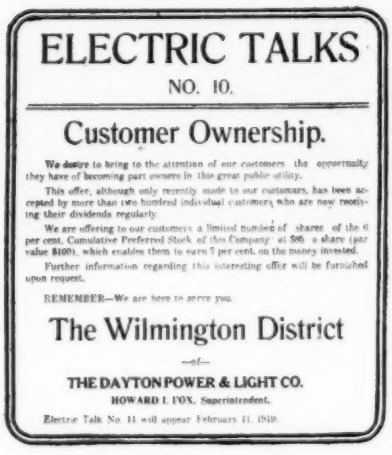
Thomas A. Edison's prediction of many years ago that some day only the rich could afford to burn candles has literally come true. Dr. Walton Clark, president of the Franklin Institute, Philadelphia, has presented some interesting figures on this subject.

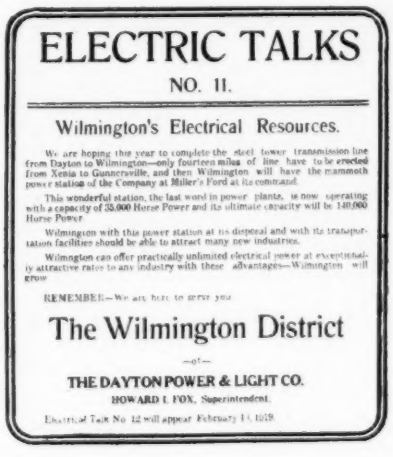
Of all necessities of life there is probably but one that annually costs each household no more today than it did a century ago. That necessity is light. The average American family in 1815 used sperm-oil and tallow candles that cost $22 a year. This $22 purchased about 9000 cp-hrs. per annum during the period from 1815 to 1855. Then came kerosene, which at that time was two-thirds as expensive per cp. as tallow candles. However, instead of reducing the annual outlay for light, the average family continued to expend about $22 a year, for which were secured some 13,500 cp-hrs.

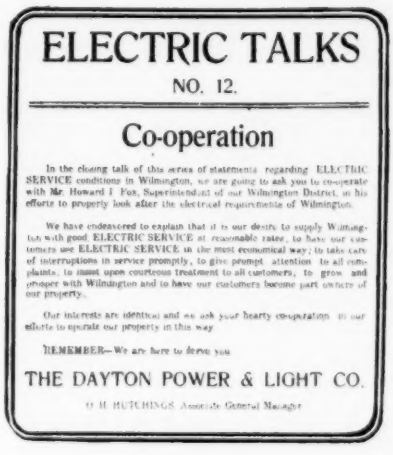
"During the decade of 1865 to 1875 the tallow candle was completely displaced by the improved kerosene lamp and illuminating gas, and the average annual cost for lighting each house was about $24. Gas then sold at $2.50 per 1000 cu. ft., and the family that used gas entirely spent about $34 a year.

"From 1875 to 1885 kerosene was reduced to 22 cents per gal. and gas to $2 per 1000 cu. ft. The average family spent $30 a year and secured 76,000 cp-hr. During the next decade the price of kerosene dropped to 13 cents per gallon, and gas went down to about $1.50; but with this reduction of 40% in prices came a reduction of only 17% in the annual expenditure for lighting, the average yearly cost then being $25 per household.

"Between 1895 and 1905 kerosene had practically


ELECTRIC TALKS
NO. 10.
Customer Ownership.
We desire to bring to the attention of our customers the opportunity they have of becoming part owners in this great public utility.
This offer, although only recently made to our customers, has been accepted by more than two hundred individual customers who are now receiving their dividends regularly.
We are offering to our customers a limited number of shares of the 6 per cent. Cumulative Preferred Stock of this Company at $95 a share (par value $100), which enables them to earn 7 per cent. on the money invested.
Further information regarding this interesting offer will be furnished upon request.
REMEMBER—We are here to serve you.
The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.
Electric Talk No. 11 will appear February 11, 1919.


ELECTRIC TALKS
NO. 11.
Wilmington's Electrical Resources.
We are hoping this year to complete the steel tower transmission line from Dayton to Wilmington—only fourteen miles of line have to be erected from Xenia to Gunnersville, and then Wilmington will have the mammoth power station of the Company at Miller's Ford at its command.
This wonderful station, the last word in power plants, is now operating with a capacity of 35,000 Horse Power and its ultimate capacity will be 140,000 Horse Power.
Wilmington with this power station at its disposal and with its transportation facilities should be able to attract many new industries.
Wilmington can offer practically unlimited electrical power at exceptionally attractive rates to any industry with these advantages—Wilmington will grow.
REMEMBER—We are here to serve you.
The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.
Electrical Talk No. 12 will appear February 13, 1919.


ELECTRIC TALKS
NO. 12.
Co-operation
In the closing talk of this series of statements regarding ELECTRIC SERVICE conditions in Wilmington, we are going to ask you to co-operate with Mr. Howard I. Fox, Superintendent of our Wilmington District, in his efforts to properly look after the electrical requirements of Wilmington.
We have endeavored to explain that it is our desire to supply Wilmington with good ELECTRIC SERVICE at reasonable rates, to have our customers use ELECTRIC SERVICE in the most economical way; to take care of interruptions in service promptly, to give prompt attention to all complaints, to insist upon courteous treatment to all customers, to grow and prosper with Wilmington and to have our customers become part owners of our property.
Our interests are identical and we ask your hearty co-operation in our efforts to operate our property in this way.
REMEMBER—We are here to serve you.
THE DAYTON POWER & LIGHT CO.
O. H. HUTCHINGS, Assistant General Manager

disappeared in city houses, for gas had not only fallen to $1 per 1000 cu. ft. in the larger cities, but electric current had fallen to 10 cents per kw-hr. Using electricity at this price, and with carbon-filament lamps, the average family secured 50,000 cp-hr. yearly, for which was paid $25.

"During the next decade (1905-1915) an astounding advance occurred in the science of economic illumination, both with gas and electricity. The Welsbach incandescent gas-burner which had been invented in 1887, was enormously improved, and coincidentally the Mazda or tungsten-filament incandescent electric lamp was developed. Today with gas at $1, a thrifty family can secure 200,000 cp-hr. of gas light for $15 a year, according to Dr. Clark; and a similar family, using electricity at 10 cents per unit, can secure 125,000 cp-hr. of electric light for $18 a year.

"Supplementing the foregoing figures of Dr. Clark, the editor of ENGINEERING AND CONTRACTING states that his appraisals of electric plants and studies of electric rates in many cities "have shown that the average family using electricity spends about $2 a month or $24 a year for light. The $24 ordinarily buys 240 kw-hr. and, using Mazda lamps, each produces about 1000 cp., so that the 240 kw-hr. generate 240,000 cp-hr. The average useful life of a Mazda lamp is 1000 hours of steady burning, or about a year at three hours a day, and adding the cost of the lamps (four yearly) to the cost of electric current ($20 yearly) enables a family annually to buy 200,000 cp-hr. for $24.

"We thus come to two astonishing facts: First, that during the last 100 years the average American family has not departed widely from an expenditure of $24 a year for light. Secondly, that the family of today, although spending almost the same sum annually for illumination as was spent by the family of a century ago, secures more than twenty times as much light! This astonishing result is due entirely to American inventors, engineers and business men.

"It is only fair to say that $24 annual expenditure for electricity above accredited to the average American family covers not only electric light, but the use of one or more household appliances, such as an electric flatiron, toaster, percolator, fan, etc., in addition to the lighting requirements. Hence, the householder of today not only gets 15 or more times as much light as his great grandfather did in 1815 for the same money but he gets a great deal of electric household help or service of different kinds in addition.

TWELVE PERTINENT QUESTIONS ABOUT DEAD SERVICES.

Much Profitable Business Can Be Secured by Systematic Campaign for This Business.

1. *How many dead services are there in your town?*
2. *If they were reconnected, how many appliances could you sell these homes?*
3. *If you got these homes to using light again and sold them an equipment of appliances, what would the income be worth?*
4. *How much investment and expenses would it require to restore these services?*
5. *What would the profit be by the end of the year?*
6. *Is it worth while?*

Here is a set of questions prepounded by the United Gas & Engineering Corp., of New York that is worth a little figuring, a little conversation and a little thought. We recommend them to every general manager of every gas or electric company in the country, and suggest the following procedure to begin with:

First.—Refer Question No. 1 to the auditor or head bookkeeper, or whoever it is who has the record of dead services.

Second.—Refer Question No. 2 to the commercial manager.

Third.—Ask the commercial manager to estimate and report on Question No. 3.

Fourth.—Refer Question No. 4 to the superintendent or the man who has the costs on reconnections and is familiar with conditions in the localities affected.

Fifth.—Have somebody take the reports on these four questions and boil them down into a clear-cut statement.

Sixth.—Take Question No. 6 and the statement into a corner by yourself and think it over.

This may sound foolish to some men, because they already know conditions well. They have an item on their regular monthly statement perhaps, that shows the number of dead services at all times. They are in touch with the selling work and know that everything is moving actively. They see no reason to suddenly get excited over this matter of dead services. And yet, it is only when we stop and throw the limelight squarely on an issue of this kind that we begin to see things. Theoretically, you know there are a lot of dead services along your lines. You know in general why they died and have not yet been resurrected. You realize that it is more profitable to win back one of these houses than to connect a new house, where cash money must be spent to get the service installed. All this you know. Yet, you forget and let these services stay dead.

Now, just for fun, let's prove that this is so by asking some more impertinent questions that nine managers out of ten will be unable to answer out of hand. And, the fact that they will not be able to answer any of the queries with definite facts and figures from their memory or from live reports right on the desk is the evidence that this matter has indeed been overlooked a bit and left neglected when it might have been turned into profits for the swelling of the dividends which the men and women stockholders, who employ you to operate this company of yours, are certainly entitled to. Here are the other questions:

7. *How long is it since you and your commercial manager have actually had a conference on the subject of dead services?*
8. *How long is it since you yourself have tried to think of some way to get these idle services to work again?*
9. *How long is it since any special letter has gone out from you or your commercial manager to the people living in these dead service houses, to try to get them on the lines again?*
10. *How long is it since any systematic canvass has been made to these prospects?*
11. *How long is it since you have personally urged your commercial manager to push this work, or have talked to the salesmen about its importance?*
12. *Does this show that you have been neglecting the dead service opportunity or does your record stand the test and show clean?*

All the war restrictions are now off the manufacture and sales of appliances. The finance situation is not yet ironed out so that the average public service company is eager to invest new money in connecting

up new customers. This points the finger squarely at dead service business and the sale of all kinds of equipment to present consumers. Here is an investment standing idle. Here is profitable work to do. Get all the facts and figures now about the dead service conditions in your territory, and see what it suggests.

LABOR PAPER COMMENDS CUSTOMER OWNERSHIP OF UTILITIES.

The *Union*, the oldest labor paper in the United States, in its issue of Feb. 21 has a copyrighted editorial commending the customer-ownership plan of distributing the investment securities of utilities among the people. The editorial is headed "Ownership of Public Utilities by the People as Distinguished from Public Ownership," and declares that public or municipal ownership is in no sense a solution of public utility problems. To the contrary, a primary cheapening of rates has almost invariably been followed by a cheapening and sometimes demoralization of service.

But, the *Union* points out, ownership of the utilities by the people is quite another matter and there is scarcely a community in the country the people of which could not acquire such substantial interest in the securities of the public service companies as to make them actual administrators to their own needs in public service.

The *Union* believes that the public must get away from the idea that public utility ownership is a big man's game, and realize that it is the most practical of all means for the small man to participate in big business, declaring that there is no better security than the average well-managed public service company's investment securities under ordinary conditions.

Proceeding along these lines, the writer shows that customer ownership of the utilities is not by any means a speculative theory and outlines the "democratic" way in which H. M. Byllesby & Co. have carried out the idea at a number of the properties under their management, closing with this advice:

"The *Union* urges upon its readers and the men in control of the public utilities the general application of the idea to utility financial operations. It is obviously practical and presents an absolute solution of the vexed question of the administration of the public utilities."

SERVICE AT COST LAW PROPOSED IN INDIANA.

A bill providing that a public utility company may enter into arrangements with a municipality or with its customers to furnish "service at cost" has the support of the Indianapolis Traction & Terminal Co. and has been introduced into the Indiana Senate by Senator Ratts. If such a bill should become a law, the Indianapolis Traction & Terminal Co., as well as other public utilities, with the approval of the Indiana Public Service Commission, could enter into a contract fixing the value of the utility on which the "service at cost" plan could be based. According to this plan, when the value of the utility is placed, the cost of service would be estimated, after interest on the investment, depreciation and other items have been determined as a basis of estimate. It is said that should the bill become a law the Indianapolis Traction & Terminal Co. would have an opportunity to adjust its franchise obligations with the city of Indianapolis in regard to street-car fares.

CLOSE VOLTAGE CONTROL FOR LIGHTING CIRCUITS.

Variation of Performance and Revenue with Voltage Indicates Importance of Good Regulation.

Electrical appliances used in the household are designed for most efficient operation at a definite predetermined voltage and operation at a voltage other than normal impairs the service, results in increased cost to the consumer, and reduces the revenue to the central stations as well. For instance, the wattage and candlepower of Mazda lamps vary at the rate of slightly more than 1.5% and 3%, respectively, for each per cent change in voltage from normal. If the voltage applied to the terminals is 3% low, less current will be consumed, reducing the revenue to the central station by 4.5% and the illumination for the consumer by 9%. The life of the lamp will be increased but the reduction in illumination is so great that the cost of light per candlepower is increased. If the voltage is 3% high, the revenue will be increased 4.5%, and the candlepower 9%, but the life of the lamp will be reduced to such an extent that again the cost per candlepower is increased.

Household appliances, such as irons, toasters, percolators, warming pads, broilers or curling irons are used to a large extent because of their convenience. For satisfactory operation, they require nearly as close regulation, however, as the incandescent lamp, as the heating and also the power consumed varies as the square of the voltage applied. A 5% drop in voltage equals a loss of approximately 10% in revenue to the central station and 10% less energy is available for heating so that unless the voltage is maintained at approximately the rated value the appliances lose their value as conveniences and dissatisfaction results.

The percentage of light load as compared to the total generating capacity of the plant may be small, but the incandescent lamp is used so much more extensively than any other electrical energy-consuming device that its performance has been accepted by the public as a standard for judging the efficiency of the operating company. Good will of the public is of incalculable value to the central station, and it is essential, therefore, that a uniform and proper voltage be maintained within reasonable limits on all lighting circuits.

Normal voltage may be maintained at the distributing center, either by supplying a constant bus voltage and designing the distributing feeders for a negligible drop, or by varying the voltage supplied the individual feeders by means of a voltage regulator to provide compensation for the feeder drop and for voltage variations at the bus.

VARIATION OF WATTAGE AND CANDLEPOWER WITH VOLTAGE FOR MAZDA LAMPS.

Normal voltage %	Candle-power %	Total watts %
95	83.1	92.2
96	86.3	93.7
97	89.6	95.3
98	93.0	96.9
99	96.4	98.4
100	100.0	100.0
101	103.6	101.6
102	107.4	103.2
103	111.2	104.8
104	115.1	106.4
105	119.0	108.0
110	140.3	116.3

Operating Practice

Weatherproof Wires — Underground Construction — Converter Transformers and Cables — Industrial Substations

OBJECTIONS TO WEATHERPROOF WIRES FOR THE HIGHER VOLTAGES.

Opinion Is Coming More and More to Disfavor Weatherproofing Wires for 6600 Volts and Above.

Weatherproof wire is coming more and more into disfavor by operating companies because it tends to give a false sense of security, it increases the cost of conductors and also the cost of the supporting structures, and really serves at best only a temporary purpose.

The presence of weatherproof insulation is of considerable assistance in minimizing damage to secondary and communication systems that chance to come into contact with the higher-voltage circuits of 7500 volts and below. The weatherproofing does not, however, serve as an insulating material of itself against shock. Taken into consideration with the insulating properties of the wooden pole, when dry, weatherproofing is useful. It is dangerous and always unwise to depend upon it, however. The consensus of opinion is that weatherproof wires should be treated with the same respect that are bare wires.

Many cities insist that "insulated" wire be employed within their boundaries. This wire, is, however, out of place in rural districts, and where not compulsory. It shortens the permissible span, thereby increasing the cost of the line for structures, as also the cost of conductor. And moreover, the weatherproofing is not permanent, but of comparatively short life and becomes a reasonably good conductor when moist.

It is the expression of R. J. McLelland, chief engineer, Electric Bond & Share Co., that, "The slight temporary and generally undependable protection afforded by the covering is usually more than offset by the largely increased wind and ice loadings which the covering occasions. Bare wires are less likely to stretch or break, are steadier in the wind and impose less loads on fastenings and structures. We have heard the statement that sleet forms less readily on bare power wires, but we have no knowledge as to this point.

"On lines with suitably spaced and supported conductors, the tendency to interruptions from swinging crosses is so largely decreased as to be more than outweighed by the more frequent troubles such as broken conductors and crosses and stretched conductors, which result from the use of insulation; that is, there is a net gain against interruption by omitting insulation.

"While in a liberal percentage of cases of contact, insulation may afford protection against shock to linemen working on live wires, the presence of insulation creates a false sense of security on the part of the workmen, which tends to carelessness. The only safe rule for linemen is to treat all primary wires as if bare, and this rule will be more effectively observed if the wires actually are bare. When live primary wires are to be worked upon the use of protective devices, such as portable shields, are much more effective protection to linemen than insulation on conductors.

"The use of covered wire is more expensive, owing both to the greater initial cost and to the fact that the wire must be replaced when the covering begins to disintegrate."

Mr. McLelland's opinions are expressed from operating experience in various parts of the country rather than from compilations or analyses of statistics. He advocates the use of bare wires for primary distribution for voltages of 6600 and above. For 4000 and 2300 volts weatherproof wire is used only when necessary to comply with local regulations.

There are four main points on which opinions differ as to this question of weatherproof versus bare wire. These points are as follows:

1. Safety
2. Operation.
3. Cost.
4. Public opinion.

These main headings may also be sub-divided, in their relation to other factors, as follows:—

1. Safety (in erection, operation and maintenance).

To—(a) Power linemen.
(b) Telephone and telegraph linemen.
(c) The public.

2. Operation.

Of—(a) Power lines.
(b) Power stations and substations.
(c) Telephone and telegraph systems.

3. Cost.

Of—(a) Wire.
(b) Labor.
(c) Operation.
(d) Maintenance.

4. Public opinion.
(a) General public opinion.
(b) Opinion in the law courts.

UNDERGROUND CONSTRUCTION.

Abstract from Report Before Western Association of Electrical Inspectors.

By F. F. Sengstock.

Every electrical engineer has ideas as to the best method of installing underground cable. The method of constructing manholes is also varied. Our committee, upon investigation, found that the better method of construction is as follows:

Dig the trench to the desired depth and width, put in a light bed of cinders at bottom, then lay a bed of concrete 4 in. thick, placing wire hair pins every 3 ft., and one pin to each row of duct, sufficiently long to extend beyond the number of ducts to be used in binding down the duct. Allow this bed to set; then

set the duct, and space board trench to form concrete block or fill trench full of concrete—the first method is the better one. All ducts must have spacers placed between them to keep the openings sufficiently large for concrete to flow between the interstices and to allow for easy joining. The method of joining may be by screw joint or thimble, made of the same material or of light iron, each joint to be coated with tar or pitch, or if necessary packed, to prevent moisture entering. The wire hair pins, usually No. 6 steel wire, are then used in binding down the ducts to keep them from floating, then the entire top is covered with 6 in. of concrete.

The manholes are to be constructed by form method, but should have a waterproof compound in the mixture to make them as water-tight as possible; the duct should be flush with the manhole walls and considerably above the floor of same.

A good example of the possible weakness of lead is brought out by several blowouts in one trench system, where the blowouts occurred within a short space of time and within a short distance of one another, and the cable had cambric tape insulation of three times the requirements for this particular voltage. There is another system where a voltage of 13,600 is used and cable is not lead covered, but pulled through duct underground, subject to continual moisture.

TRANSFORMER SPECIFICATIONS FOR SYNCHRONOUS CONVERTER SERVICE.

Tap Recommendations and Standardized Cables and Duct Sizes.

Many consulting engineers specify details in transformer design that are unnecessary for satisfactory operating performance while they do add to the cost of the transformers hinder their delivery and will delay future deliveries, often needed in a hurry.

Standard transformers for railway converters of the oil-insulated, self-cooled type for converter capacities of 2000 kw. and below are shown in the accompanying table. These units have been standardized and answer the purpose for the majority of synchronous converter installations, says C. F. Lloyd, Westinghouse Electric & Mfg. Co.

STANDARD OIL-INSULATED, SELF-COOLED TRANSFORMER RATINGS FOR SYNCHRONOUS CONVERTER SERVICE.

Rating Conv. Kw.	Rat'g trans. 1-phase	Rat'g trans. 3-phase	Voltages and frequency. 2200 cycles	3300 cycles	11,000 cycles	13,200 cycles	16,500 cycles	22,000 cycles	33,000 cycles
300	100	300	60/25	60/25	60/25	60/25	60/25	60/25	60/25
500	167	500	60/25	60/25	60/25	60/25	60/25	60/25	60/25
750	250	750	60	60	60	60	60	60	60
1000	333		60/25	60/25	60/25	60/25	60/25	60/25	60/25
1500	500		60/25	60/25	60/25	60/25	60/25	60/25	60/25
2000	667		60/25	60/25	60/25	60/25	60/25	60/25	60/25

Standard transformers are provided with high-tension full capacity taps to take care of a total variation of 10% in the line voltage. In capacities up to 200 kv-a. inclusive, taps are provided for 5% and 10% voltage below normal. In capacities above 200 kv-a. taps are provided for voltages 2½, 5, 7½ and 10% below normal. The low-tension winding has no taps other than those for obtaining suitable reduced voltage for starting. All low-tension leads are brought through the case. All connections available on the high-tension winding should be brought up to the terminal board and only such leads as are required for external connections, should be brought through the case. When different high-tension connections are required, they should be made at the terminal board inside the transformer case. There may be isolated cases requiring special high-tension tap arrangements with a greater number than standard. These can usually be accomplished but cost more and very often make it impracticable to use three-phase transformers, due to mechanical reasons. It is usually impracticable to put additional taps on the low-tension winding on account of the heavy current and small number of turns.

Standard transformers are designed with 15% inherent reactance for compounding purposes. This arrangement is not only less expensive but requires less space, reduces wiring, etc., over the older practice of supplying transformers of normal reactance with external reactance coils.

The acompanying table shows the cross-section of conductors in circular mils recommended for the main direct-current positive and negative, equalizer and alternating current cables of synchronous converters of from 300 kw. to 4000 kw. capacity. This data also dictates the drill size for drilling the lugs. Conductors of circular cross-section are referred to: strap is, however, often employed, a condition that does not affect the cross-sectional area.

STANDARD CABLE SIZES AND TERMINAL DRILLING FOR SYNCHRONOUS CONVERTERS.

	——Direct current—— Main		Equalizer		Alternating current	
Kw.	No. cables	Size cable c. m.	No. cables	Size cable c. m.	No. cables	Size cable c. m.
300	1	800,000	1	400,000	1	400,000
500	2	600,000	1	600,000	1	600,000
750	3	1,000,000	1	1,000,000	1	1,000,000
1,000	4	1,000,000	2	600,000	2	600,000
1,500	5	1,000,000	2	1,000,000	2	1,000,000
2,000	6	1,000,000	3	1,000,000	3	1,000,000
3,000	8	1,000,000	4	1,000,000	4	1,000,000
4,000	12	1,000,000	6	1,000,000	5	1,000,000

DETAILS OF INDUSTRIAL TRANSFORMER SUBSTATIONS.

In a paper read before the Ohio Electric Light Association, Cleveland, Feb. 20, on the subject of "Industrial Power Substations," G. B. Schneeberger, electrical engineer, Cleveland Electric Illuminating Co., mentioned a number of interesting facts in connection with the industrial substations installed by his company. Brick housings are used where feasible, although concrete is also used sometimes.

In the layout of these transformer vaults or industrial substations special care is taken to prevent the electricians of the customer from having to have access to the central-station company's vaults, all switching being done without the vault being entered. Secondary protection is under the supervision of the customer, all other apparatus being under the supervision of the utility. In the company's industrial substations, cartridge fuses are employed for capacities below 150 kw., while oil circuit-breakers are used for capacities of 150 kw. and above. The oil circuit-breakers are solenoid operated, their trip coils being connected in series with the main current. Lightning troubles have occurred in these trip coils, but since the coils are now submerged in the oil, lightning troubles have practically disappeared. Duplicate supply is not ordinarily furnished an industrial substation except for installations of 500 kw. and above.

Contracting-Construction

Motor Maintenance and Repair Service by Contractors—Brooklyn Contractors to Join Show—Handy Wiring Chart

SERVICE IN ELECTRICAL MACHINERY REPAIR BUSINESS.

Valuable Service Rendered in Repair and Maintenance of Motors, Generators, Starters, Transformers, Etc.—Requirements of the Organization and Shop Equipment.

The rapidly growing use of electric drive for industrial purposes has brought about what amounts practically to a revolution in the application of power in factories, shops and mills. Electric power has now become the chief motive force for driving the myriads of machines in our thousands of industrial plants. The electric motor has taken the place of the steam engine in importance to our industries. Consequently the reliability of the service rendered by electric motors is a matter of prime interest to the owners and managers of industrial plants.

In the average plant the motor is likely to be operated by a man or woman employe who knows little or nothing about electrical matters. Misuse of the motor and of its starter is therefore not uncommon. Hence, although the motor is becoming more and more a very rugged machine, the abuse it is subjected to is occasionally bound to result in troubles developing. An armature or field coil may be short-circuited or open-circuited; if brushes are used, lack of attention to their adjustment and general upkeep may cause almost complete failure; the starter or compensator may be partly burned out by improper operation; bearings carelessly lubricated or not attended to at all may cause excessive friction, "hot boxes," or actual scraping of rotor and stator. These and other similar tronbles may cause partial or complete shutdown of the motor and thus interfere with the operation of important machines. The manufacturer does not want his machines idle, however, and even though motor troubles are not as frequent perhaps as those where mechanical drive through shafting and ropes or belts all operated from a steam engine is used, they are equally vexatious. Unless arrangements are made for promptly taking care of motor troubles, electric drive is likely to get a bad reputation that it does not deserve. Efforts may be successfully made to secure a substantially foolproof outfit, but it requires some attention occasionally to keep it in reasonable operating condition since no machine can be expected to keep itself in such condition automatically.

Different Methods of Providing Maintenance Service.

The question thus presented to the owner of the factory is, how can the motor and auxiliary starter equipment be best given the periodic attention necessary and the annual or the sudden emergency overhaul when required? There are several such methods, the chief of which may be classified briefly as follows:

(1) Employ a competent electrician (or a number of electricians in case of a large plant) to devote all his (or their) time to keeping the motors and other electrical equipment in best working condition and to make whatever repairs to the same that may be necessary.

(2) Contract for regular maintenance service for the motors and accessories with a reliable firm that either specializes in such service or includes in its organization a department of specialists in keeping motors in proper order and in restoring them to such condition if they have met with some mishap and need more or less general repair.

(3) Entrust the ordinary maintenance (such as oiling and cleaning) to some "handy" man about the shop and in case a breakdown of a motor occurs send it back to the manufacturer for repairs.

Various modifications and combinations of these methods may be and are being used, but they constitute the three principal and distinct courses of procedure that may be followed.

It is obvious that method (1) has distinct advantages in that the motors and starters, in fact all the electrical equipment of the plant, is under the constant care of a man whose entire duty it is to see that the equipment is in shipshape order. In this way the liability for serious breakdowns and interruption of service is minimized and, if a motor should be damaged by gross negligence of an operator or by pure accident, it can be quickly repaired and put back into service, provided the electrician has facilities at hand for rewinding armatures and fields, truing up commutators, fixing brush gears, refinishing bearings, etc. In quite large plants this method is very generally employed. In fact, it is not uncommon to find a special electrician's department with its own well equipped repair shop in which a motor can be practically rebuilt, if necessary, in relatively short time. In such a plant also there will usually be kept spare parts of motors and also starters so that delays are reduced to a minimum. The keeping of extra parts can become a simple or very cumbersome matter, however, depending on how completely standardized the motor equipment is, for it is evident that if there are very many sizes, types and makes of motors in use the stock of spare parts would not only take up much room but would tie up a considerable amount of idle capital. In plants where this method is followed the electrician, or his crew of assistants, usually also takes care of the lights, generators, switchboards, and other electrical equipment on the premises, and also makes extensions and alterations to the entire electrical system.

Use of method (2) has developed slowly but steadily and when the matter is placed in the hands of a competent firm the results it gives are extremely satisfactory to all concerned. It is based on the same principle as is followed by the owner of an automobile who has his car kept in trim by an experienced garage man who also takes care of all repairs. This method

has decided advantages in that the motors are looked after at regular intervals by a motor specialist who thus keeps them in the best possible condition and can foretell when a more or less general overhaul is desirable so as to obviate gradually growing depreciation from developing into breakdown. This method is best adapted to many medium-sized factories and to practically all small shops.

Method (3) is followed largely by small and scattered shops who either can not or do not want to employ a shop electrician and who can not or do not know about engaging the services of an organization specializing in motor maintenance and repair. Consequently they trust to luck by having some more or less skilled mechanic take care of the motors. When serious trouble develops he may mend it, but usually fails in the attempt if he does not actually aggravate it, so that the only thing left is to send the motor back to the manufacturer for repairs. If the manufacturer is located nearby, or has a repair shop in the vicinity, this is an excellent plan because no one, as a rule, is better fitted to repair a motor than the manufacturer who produced it, who knows all the details of its construction, has the parts available and who is most eager to restore the motor to service and thus maintain the reputation of his product. If the motor manufacturer's plant or nearest repair shop is far away, however, the delay involved in sending the motor to him and in returning it is likely to be very serious and involve too long a shutdown of important machinery.

From this hasty review it is evident that method (2) has a distinct field of usefulness. It does not take the place of method (1) which is best suited to large industrial plants, nor does it compete with that feature of method (3) which calls for sending motors back to the manufacturer when he is accessible and agreeable to furnishing repair service as speedily as possible. Recognition of the utility of method (2), based on the excellence of the results it has rendered under proper conditions, has resulted in its steady growth of popularity. This in turn warrants some consideration in that the opinion that this business is a very profitable one may lead some electrical men to try to engage in it who are not fitted to do so properly.

General Requirements of a Motor Service Organization.

Before undertaking a motor service business it must be remembered that its success is based primarily on the service it is capable of rendering and does render. "Service" in this case involves not only the quality of the work done but also its speed. Both are equally important and one without the other will result in failure of the venture. It is easy to see, of course, that when a motor is repaired it must be properly done, else the firm's reputation will be spoiled almost before it is established. If the repair though well done, is not completed any more speedily than by sending the motor to a distant manufacturer's plant, the value of the service rendered is not exceptional and the business could hardly develop under such circumstances. To back up service the firm must have reliability and financial responsibility in order to secure the confidence of prospective customers.

Lack of reliability and service has quickly put many firms out of business that had most of the other requisites to be mentioned below. It is folly to attempt to engage in this highly specialized business unless all the features necessary to its success have been given due consideration.

Full knowledge of the principles of operation, design and construction of the various types and makes of motors is essential not only on the part of the directing head of the concern but also on the part of the foremen and the inspectors or estimators who call on customers either for regular maintenance work or to give a price on proposed maintenance service and occasionally also on special repairs. No one can engage in this work properly who does not know how different types of direct-current and alternating-current motors operate, how they are built and how they may frequently be rewound for different voltages, frequencies, phases and speeds where it is inexpedient to purchase a new machine.

The workmen who repair, rewind or entirely rebuild motors should be well trained in this work because, even if under the general care of a well trained and experienced foreman or the boss himself, many times a special rush job may have to be handled while the foreman or boss is occupied on other important work. Thus a defect that will not be noticed on inspection or test may occur that is likely to bring the motor back in a short time. If the organization is quite a large one, beginners may be engaged as apprentices or helpers, but they should never be entrusted with responsible work until they have had not only a good shop training but also preferably a fair technical training at least as good as that of a reliable correspondence school course and better yet an evening course with laboratory work in a good electrical school. Unfortunately, many chaps who have had such courses imagine that they know all about motors. They should be thoroughly tried out before their confident statements are accepted.

Shop facilities for handling the work must be complete and arranged to secure most efficient results. This means a good asortment of lathes and other machine tools, equipment for impregnating coils with insulating compounds, instruments for testing motors both while stationary and while running at various loads. Simple hoists of ample capacity must be available so that heavy motor frames or rotors can be quickly raised without requiring much manual work or calling on the whole force to drop their tasks and help in a "lift." The shop should be well lighted both by day and in the evening, it should be properly heated and ventilated, and should be well arranged so as to systematize and facilitate the work.

Speed has already been mentioned. It is the reason for the last requirements. But speed in the shop is of little avail if the shop is so located as to involve tedious shipping delays. Selection of a suitable site in an industrial district with excellent shipping facilities is therefore of great importance. Railroad, electric interurban and other express connections should be the best possible. For local deliveries there should be reliable motor trucks, preferably equipped with a crane for rapid loading and unloading.

Possibilities for Development of Business.

In many cases where electrical contracting firms have turned to motor maintenance and repair service as a side line at first, they have eventually specialized in this work. In fact it is naturally a specialized business and works out better when it constitutes the principal activity of a concern that may do some electrical contracting on the side occasionally, than when it is the other way about. However, when a very large contracting organization sets up a special department for this service it may work out quite satisfactorily. Whether it shall be a department or the principal business of a concern depends on the amount of busi-

ness available, that is whether it is an industrial section and also how much competition there is. It is probably better for a contracting firm doing a general electrical work to turn over any motor maintenance and repair work to a firm specializing in this and have the latter reciprocate by turning to it wiring work that comes to its notice. Reciprocity and co-operation pays.

Regardless of whether the motor business is the main feature or only a department in general electrical business, there are opportunities for developing it. There are many shops and small factories in which no consideration is given to motor maintenance and no thought to provision for possible breakdown. The value of regular service can be brought home to the owners of such shops, especially after some motor troubles develop. But some advertising or circular letter campaign must be indulged in to call attention to the facilities available for prompt motor service and impressing the name of the organization on the factory owner's mind. In rendering this service attention may frequently be directed to improvements in the motor wiring or starters, which can be attended to when there is a lull in other work.

Many motor service concerns engage also in purchase, sale and rental of used motors. These machines are frequently rebuilt motors that may have been secured at low cost in sadly depleted condition and entirely rewound and refinished at leisure, thus improving the "load-factor" of the shop and bringing in some income. Of course, considerable capital is tied up in this branch of the business and it should not be undertaken unless ample resources can be secured.

The foregoing are a few general comments on this business, which has become well established and constitutes an important economic service in the electrical industry. To give a better idea of what facilities are available in typical organizations engaged in this work, we will publish in successive issues illustrations and brief articles descriptive of plants specially equipped for it.

BROOKLYN CONTRACTORS TO TAKE PART IN ENGINEERING SHOW.

Louis Kalischer in Charge of Combined Electrical Exhibit to Be Held in April.

One of the most important and interesting exhibits in connection with the 1919 annual exhibit of the Brooklyn Engineers' Club promises to be that of the Long Island Electrical Contractors' Association. The exhibition is to be held at the Twenty-third Regiment Armory, Brooklyn, during the week commencing April 28.

The contractors' exhibit is in charge of Louis Kalischer, of Brooklyn, past president of the association and one of the most prominent personages in the electrical contracting field. Under his leadership, the association has secured 2500 sq. ft. of floor space and will shortly begin the erection of an immense and interesting exhibit in this space. It is to be the only electrical exhibit held in connection with the show and will include, in addition to the exhibits by the members of the Association, those of the Brooklyn Edison Co. and numerous prominent manufacturers.

In securing this large space in what is generally conceded to be the greatest industrial event ever held in Brooklyn, Mr. Kalischer and his associates are very fortunate and are to be complimented on the keen foresight which was displayed in contracting for the space while the whole undertaking was in an embryo state. The combined exhibit, as planned, will include a display of a selected list of electrical appliances as applying to industrial activities. It is formed to permit the various industries to view the last word in safety apparatus, motor appliance and special fittings as well as every accessory in an electrical sense and the latest improvements in every electrical device. The exhibit will be attended each day by members of the association amply supplied with literature and important data, representatives of various companies directly and indirectly associated as well as several of the prominent engineers who will be there to answer questions that might enlighten the public or trade.

Mr. Kalischer, who is the owner of the largest electrical contracting business in Brooklyn, is a prominent figure in national contracting affairs and a brief outline of his career may be of interest. A firm believer in the Goodwin plan, he has been very active in introducing it in various sections of the country in co-operation with Mr. Goodwin.

He is a native of Brooklyn and entered the electrical field in 1890. He has had a wide and varied experience and in the early years of his career found time to finish courses at Pratt Institute and the Cooper Union in addition to his efforts expended during the day time.

His activities have carried him far, for he has been connected as directing engineer and installed plants throughout the country. He entered the electrical contracting business in 1906. He is associated in either an official or membership capacity with most of the clubs or associate organizations in Brooklyn and the surrounding territory, and still finds time to show an interest in civic and charitable work. At present he is also acting as consulting engineer for the Newman & Carey Subway Construction Co. in the construction of the Nostrand avenue subway in Brooklyn.

Some of his immediate connections include the National Electrical Contractors' Association, as member; past president of the Electrical Contractors' Association of Long Island; past president of the Kilowatt Club of Brooklyn, chairman of the advisory board of the Electrical Contractors' Association of Greater New York, chairman of the Metropolitan District of the New York State Association of Electrical Contractors and Dealers; member of the Brooklyn Engineers' Club and the Brooklyn Chamber of Commerce; chairman of the Contractors-Dealers' Division of the Electrical Industries Committee of the Third and Fourth Liberty Loans of Greater New York; member of the New York Electrical Society, the Williamsburg Luncheon Club, the Watt Hour Club, and member of Henry D. Woodworth P. S. Association, No. 17; chairman of the Electrical Section of the Brooklyn Engineers' Industrial Association; contractors' representative of the Joint Committee of Lamp Distribution for Greater New York; director of the Unity Club of Brooklyn, the Anawanda Club of Brooklyn and the B. P. O. Elks, No. 22, of Brooklyn; trustee of the Hebrew Orphan Asylum of Brooklyn; represented the Long Island contractors at the national convention at San Francisco in 1916 and New Orleans in 1917.

He also drew up the original draft of the electrical contractors' license law now enforced in New York City, in collaboration with the city authorities. As chairman of the Contractor-Dealers' Division of the Electrical Industries Committee of the Third and

Fourth Liberty Loans, Mr. Kalischer appointed subcommittees representing the Kilowatt Club of Brooklyn and the Watthour Club of Queens, and the electrical contractors' interests of the metropolitan district, including the Electrical Workers' Union, of which he was a member and statistician for 12 years. The full committee's efforts yielded well over $9,000,000 in subscriptions, and they secured the only flag in the United States bearing twenty-one stars, which represent a 50% increase for their branch of trade.

WIRING CHART FOR 110-125-VOLT HOUSE LIGHTING.

Chart Enables Instantly Finding Proper Wire Size to Get Proper Lamp Voltage Throughout a Large House.

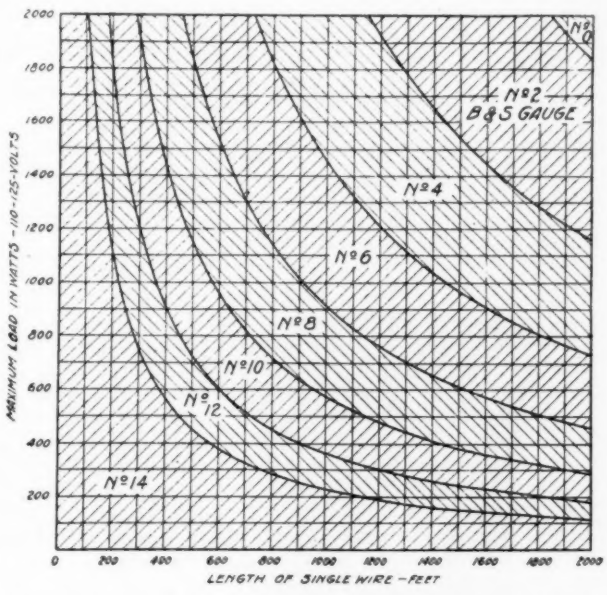
A very convenient wiring chart for determining the proper wire size for use on circuits of 110-125-volt country home lighting systems has just been prepared by the Engineering Department of the National Lamp Works of General Electric Co. The steady demand for the low-voltage (28-32 volts) wiring chart for country homes, distributed in July of last year, and reproduced in the July 13, 1918, issue of ELECTRICAL REVIEW, shows that the information contained theron is valuable and conveniently arranged. For this reason, the chart for the 110-125-volt systems is designed along the same lines. However, to aid in distinguishing the two charts, the new one is differently colored.

Although prepared especially for country house lighting circuits, this chart is of value in determining the wire size in any building or small group of buildings where simple circuits are to be laid out to considerable distances or fairly heavy leads are to be handled at moderate distances, all to be served without objectionable voltage drop in the conductors. Ordinarily No. 14 B. & S. copper wire is entirely satisfactory for the usual lighting loads of the house itself. However, where the product of the load, in watts, and the length of the single wire, in feet, exceeds 45,000, it is necessary to use No. 12 wire or larger, as shown in the chart.

This chart is based on a maximum limit of 5 volts drop in any circuit. To find the proper wire size for a load of 600 watts at a distance of 250 ft., for instance, (which requires 500 ft. of single wire) follow the 600-watt line horizontally across the chart until it intersects the 500-ft. vertical line. The intersection lies in the No. 12 zone, showing that No. 12 wire must be used. In the same way find the wire size for any other combination of load and distance. For outdoor runs between the house where the plant is located and outbuildings, it is usually advisable to use at least No. 12 wire so as to have sufficient mechanical strength.

In connection with the high and low-voltage systems, it should be noted that there is a fundamental difference between the two designations, 28-32-volt lamps and 110-125-volt lamps. In the first instance, a single class of lamps, any one of which is designed to operate on any voltage within the range indicated, is referred to; but, in the latter case, there is a different lamp for each individual voltage between 110 and 125 volts. While the characteristics of all the lamps in this range are such as to allow of their being grouped together for many purposes, as in the wiring chart just prepared, it should be remembered that a 110-volt lamp is to be burned only on a 110-volt circuit; a 115-volt lamp on a 115-volt circuit, or, in general, each lamp only on a circuit of the voltage for which that lamp was designed.

As indicated above, the information on the chart for 110-125 volt systems may be used for all voltages within the range. Either chart may be obtained on



Convenient Chart for Finding Proper Wire Size in Wiring Country Homes or Other Houses for Lighting.

request from the Engineering Department, National Lamp Works of General Electric Co., Nela Park, Cleveland, Ohio.

GENERAL ELECTRIC COMPANY ANNOUNCES NEW WIRING DEVICE PRICE SCHEDULE.

List Prices Are Doubled and New Schedule of Discounts Established.

A new price schedule affecting the entire line of General Electric wiring devices, except enclosed fuses and some similar material, was announced under date of March 1.

During the active period of the war, when costs advanced very rapidly, the easiest way to accomplish each advance in prices was to reduce discounts. This resulted in a most unsatisfactory method of figuring net prices on many lines, necessitating, as it did, in many instances, selling wiring devices on a list-plus basis. There is no indication that costs will be sufficiently reduced, for some time to come, to warrant the continuing of this present unsatisfactory method of pricing.

The company decided that the only way immediately to remedy this, without making present catalogs obsolete, was to declare practically all list prices doubled and establish a new schedule of discounts from these doubled lists which gives the same net prices as are now in effect.

The Electrical Contractors' Association of Kansas City, Mo., held its monthly session on Feb. 25, at the Kupper Hotel. The full attendance and the interest in discussions indicated the earnestness of members in the organization's work. The new code and problems of labor were discussed.

New Appliances

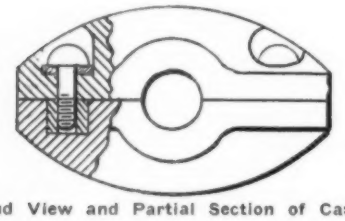
Connecting Plug to Fit Round or Flat Terminals of Heating Appliances—Convenient Waterless Electric Glue Pots

A Plug That Fits All Heating Devices.

In spite of efforts by a committee of the National Electric Light Association to secure standardization of the terminal contacts of electric heating devices, the manufacturers of these useful and popular appliances still make these terminals of many special types so that it is impossible to interchange the connecting cords that are usually furnished with each device unless all the appliances that are to be used are made by the same manufacturer. This has resulted in inconvenience to those who are liberal users of electrical appliances and who would be glad to secure unlimited interchangeability of cords.

Full-size View of Interchangeable Plug for Connecting to Any Make of Common Heating Device.

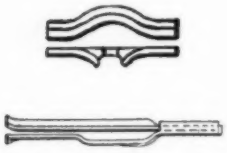
To meet this growing need the Redtop Electric Co., Inc., 8 West 19th street, New York City, has placed on the market an interchangeable plug that can be used with any of the numerous makes of electric flatirons,



End View and Partial Section of Case.

toasters, percolators, tea urns, table stoves, room heaters and other portable household heating devices. This plug is known as the "Fitzall" plug. Its body is made of a black heatproof insulating composition that is knurled on the sides and highly polished. The secret of the success of this device is in the construction of the contact dips which are shaped so as to make and maintain perfect contact on either flat or round terminals. From the accompanying sketch showing the mouth of the dip it is seen that one side has a rounded surface so as to engage any round terminal, while the other is flat in order to engage any flat terminal. One of the two sides of the dip is made of spring brass and is so formed as to preserve its resiliency indefinitely, thus insuring continued perfect contact after long use. Liberal contact surface is provided.

This plug is very easily wired to the cord. Only three screws need be removed to open the case in the middle. There are no loose nuts as threaded metal bushings are molded into one half of the case. The opening where the cord emerges from the case has well rounded, smooth edges which can not fray the covering of the cord and do not require the customary protecting spring. The casing is durable and not nearly so fragile as a porcelain plug.



Mouth or Front View of Contact Clip at Top—Side View of Clip Below.

Dry-Type Electric Glue Pots for Home and Shop Use.

Electrically heated glue pots have advantages possessed by no other method of heating glue. There is no smoke, no soot, no flame and no gas or steam pipe, only a clean dry-type glue pot having a flexible cord to connect it to the lamp socket. Electrically heated glue pots without a water bath or water jacket have been demonstrated by practical experience to be far superior in every respect to the old wet-type glue pots. It has been proven that as long as the input to the electric heater is such that the glue pot is kept at the proper working temperature, the best results are obtained.

There are many distinct advantages and points of improvements of the new dry-type glue pots over all other forms of heating glue. Among the most important are:

(a) There is no water bath and therefore no water to exaporate and cause the heater to burn out and burn the glue.

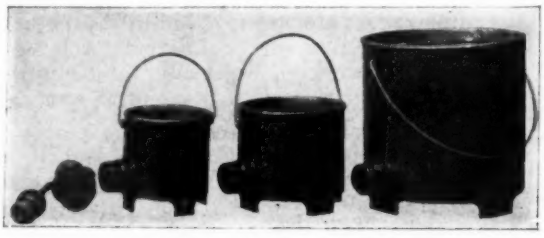
(b) The dry-type pot has a single-heat constant-input heater; there is no need in having two heats, "high" and "running" and the temperature is constant for continuous operation.

(c) The necessity of continual addition of water to a water bath is done away with and the inconvenience and sloppiness of the wet bath are therefore eliminated.

(d) The new dry glue pot is more efficient because none of the energy is required to heat a water bath before the glue is heated

(e) The dry glue pot saves time since the glue is heated directly and there is no water bath to be heated first.

In the new dry-type glue pot the spun-copper glue vessel fits snugly into the sheet-steel outer jacket in such a manner as to make good thermal contact with the heating element, which is an integral part of the sheet-steel bottom plates. An extra sheet-steel plate is placed underneath the heating element with a dead-air space between; this keeps the heat generated in the heating element from being conducted downward from the pot.



Westinghouse Dry-Type Glue Pots.

The heater resistance is so designed that it takes just the proper electrical input to maintain the glue at the correct working temperature when the pot is operated continuously. As a consequence whether the glue is being used or not, there is positively no danger of overheating. Tests have shown that with the dry-type glue pot it takes approximately 15 minutes to heat the glue to a sufficient temperature to be used.

In the up-to-date home a small-sized glue pot will be found a very convenient article. Furniture, picture frames and other articles are continually coming loose and broken, and prompt application of glue would save many a trip to the repair shop. The wideawake boy is also a frequent user of glue at his basement work bench. The dry-type glue pot in the pint size is a very convenient and ideal appliance for such purposes, as it may be heated without any muss or inconvenience by simply connecting the attachment plug to a lamp socket and turning on the current. A one-pint glue pot, made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is rated at 60 watts or 110 volts. There are two other sizes manufactured: the quart and 4-quart sizes, rated at 80 and 140 watts, respectively. These latter are for shop use.

Trade Activities

Bates Expanded Steel Truss Ships Factory to Italy—Electric Storage Battery Holds Sales Convention—Catalogs

Betts & Betts Corporation, New York, has issued Transformer Bulletin 125, which illustrates and describes in a brief and comprehensive manner B & B low voltage transformers. These are standard 100-150 volts, 60 cycles and are furnished for alternating current only. Another circular (Bulletin 128) features B & B refillable fuse plugs, patents on which are now pending.

Walker Vehicle Co., New York, Boston and Chicago, recently issued a 40-page catalog (No. 19), which has for its subject Walker trucks and tractors, the balance drive electric for road use, and embodies a conservative statement of facts on electric truck compiled by large neutral truck users, and briefly explains definite economic reasons by cost figures for the great economy of this drive. The two-page introduction contains "The Walker Truck Story for Busy Men" which points out the superiority of the electric over the gasoline truck. The greater part of this book is devoted to handsome illustrations of the Walker truck in use, representing practically every line of business. In addition an index of concerns using Walker trucks and descriptions, specifications, etc., are given.

S. J. Stewart (Electric), New Orleans, La., will celebrate this month its twentieth anniversary of successful operation in the electrical field. This establishment which had its inception in the woodshed of the early home of its owner, in March, 1899, has steadily grown until the business now occupies a four-story building in one of the busiest streets in New Orleans. It has reached the stage where the present four-story building has not sufficient space to care for its constantly increasing business. Not only has Mr. Stewart kept abreast of the times in the installation of new apparatus in his up-to-date shop wherein electrical apparatus is made over to equal new, but he has invented and perfected many of the devices used in the establishment, until it has reached the stage of perfection that it not only equals any shop in the way of thoroughness of equipment, but supersedes many in the southern territory. The business of rebuilding and repairing electrical equipment required twenty years of tenacity and unwavering optimism through the many vicissitudes and discouragements which almost every business experiences and which many are unable to overcome, but S. J. Stewart (Electric) has reaped the fruits of its labor and is enabled to celebrate its twentieth anniversary of business success in the electrical field and claim the reputation of being one of the largest of its kind in the South.

Davis Slate & Manufacturing Co., Chicago, recently completed arrangements for the equipment of a modern slate factory at Toronto, Canada, which will enable the company to better serve its constantly increasing number of customers in the Dominion. A. H. Winter Joyner, of 100 Wellington street, Toronto, has been appointed Canadian sales manager, and William Wright, of Toronto, superintendent of production.

Chicago Pneumatic Tool Co. has established a general Pacific Coast sales office and stock display quarters at 175 First street, San Francisco, where B. H. Tripp is in charge as Pacific Coast manager. Branch offices under Mr. Tripp's supervision have been opened at Los Angeles, Portland and Phoenix, and the plans contemplate opening a branch in Seattle at a later date. Under this arrangement the company's Pacific Coast business will be handled directly through its own offices. It is likewise a move to effect greater expansion in that section, including the handling of export trade with the Orient and the west coast of Central and South America.

Bates Expanded Steel Truss Co., to aid in the reconstruction of Europe, has during the past week shipped to Italy a duplicate of its plant at East Chicago. The shipment, comprised 340,000 pounds of specially built machinery, motors and tools, represents the first big contribution of enterprise and money by Chicagoans toward the reconstruction of the devastated areas abroad, and will be of valuable assistance in the revival of the nation's industries. Italian engineers, who signed the contracts under which the Societa Ilva, the government controlled steel corporation of Italy, advanced $400,000 for the establishment of the plant in Italy. The transplanted Chicago factory will make steel poles to carry electric power wires, and will be a great asset in the development of Italy's water power resources, which has been retarded because of the absence of suitable wood on which to string wires. When the war broke out A. J. Bates, a veteran engineer, and his three sons were bringing to perfection the idea of an expanded steel pole or one piece truss. His plant in the Calumet region housed two remarkable machines which the elder Bates had conceived and built, consisting of a rotary shears with 12-ft. wheel knives and a big expanding machine. Mr. Bates ran long pieces of steel, rolled "I" shape through his shears, cutting them at certain spots, heated them, and then expanded them in his expanding machine so that they had the proper truss strength. The factory was called upon for some poles for war emergencies, and when Italians heard about them, Rinaldo Negra, an engineer, was sent to Chicago, followed by other engineers. The Italians approved the idea and entered into negotiations for the establishment of a duplicate of the Bates factory in Italy at the conclusion of the war. Many war priorities made it impossible for the company to obtain much of the material for the machines that had to be built. Walter A. Bates finally solved the problem and then proceeded to build the machines needed for the Italian plant. Walter A. Bates will have charge of the plant at Savona, Italy, and will sail for Italy about March 15.

Trumbull Electric Manufacturing Co., Plainville, Conn., manufacturer of Circle T switches, is distributing Bulletin No. 2 illustrating and describing "Safety Service" externally operated switches, and lists numerous important additions to this line. Among these are no fuse switches, single and double throw; fusible switches, double throw; 400-600 ampere switches in various poles, "Straight Thru" motor starting switches with under voltage release coil or with hand release, and motor reversing switches. The bulletin emphasizes very strongly the importance of the switch and points out the salient features in "Safety Service" switches. Conveniently located in the back part of the publication is a table of dimensions of fusible "Safety Service" switches and boxes, also an index to catalog numbers. Copies of this bulletin will be furnished upon request.

Pittsburgh Furnace Co., Pittsburgh, Pa. and Milwaukee, Wis., manufacturer of electric arc furnaces, has published in pamphlet form an article entitled "The Electric Furnace in the Steel Industry," by W. E. Moore, a prominent engineer of Pittsburgh, Pa. The author discusses the various methods employed in the production of steel for the foundry, enumerating their particular advantages and objections, and reviews the notable strides of the electric furnace in steel foundry industries where castings of small and medium size are made. Electric steel which, commercially, was introduced less than a decade ago, has made its greatest advance since 1917 and is constantly gaining in popularity. A detailed description of the Pittsburgh electric furnace is entered into and the text clarified by diagrams and other illustrations. An interesting table of comparative cost data is given, which shows present day operating costs for converter steel and electric steel. Numerous illustrations of installations are included with testimonials bearing evidence of the excellent results obtained from the Pittsburgh electric furnace.

Railway & Industrial Engineering Co., with works and main offices at Greensburg, Pa., in a letter recently sent to its customers, advises that its business has been readjusted from a war to a peace basis and the company is again in a position to take care of demands for "R. & I. E. Service," which has met with widespread favor in the past. The company solicits inquiries for Burke horn gap switches; Burke lightning arresters; outdoor substations, steel towers and horn gap equipment for any need. This company is a pioneer in its field with years of specialized experience in the designing and building of outdoor substations for all voltages and capacities, and is able to render very efficient service in its field. It offers its co-operation to customers, furnishing drawings, its recommendations and costs on outdoor substation work and will assist in connection with details of this work.

The Meachem Gear Corporation, Syracuse, N. Y., has incorporated for the purpose of taking over from the New Process Gear Corporation, the manufacture of New Process rawhide pinions and for the general manufacture of gears of all kinds. The following are the officers of the new corporation: T. G. Meachem, president; T. W. Meachem, vice-president; G. W. Wood, secretary, and J. F. S. Meachem, treasurer. The company is incorporated for $300,000 and has purchased a three-story building at 411-415 Canadal street, Syracuse, N. Y., which will be devoted exclusively to the manufacture of gears. The organizers of this company are those who owned and controlled the New Process Gear Corporation and the New Process Raw Hide Co. for a period of 30 years. Associated with the Meachems on the staff of this concern are George W. Wood, secretary and superintendent, and H. W. Kiddle, assistant superintendent, who was in charge of the manufacture of rawhide and the rawhide pinion department of the old company. The plant recently purchased has been remodeled and began operations on March 1, at which time it took over the rawhide pinion business, the hide plant at 811 Free street, Syracuse, and all raw material and uncompleted orders pertaining to this branch of the business. The company will also engage in the manufacture of a complete line of cut metal gears for mills and factories of all kinds.

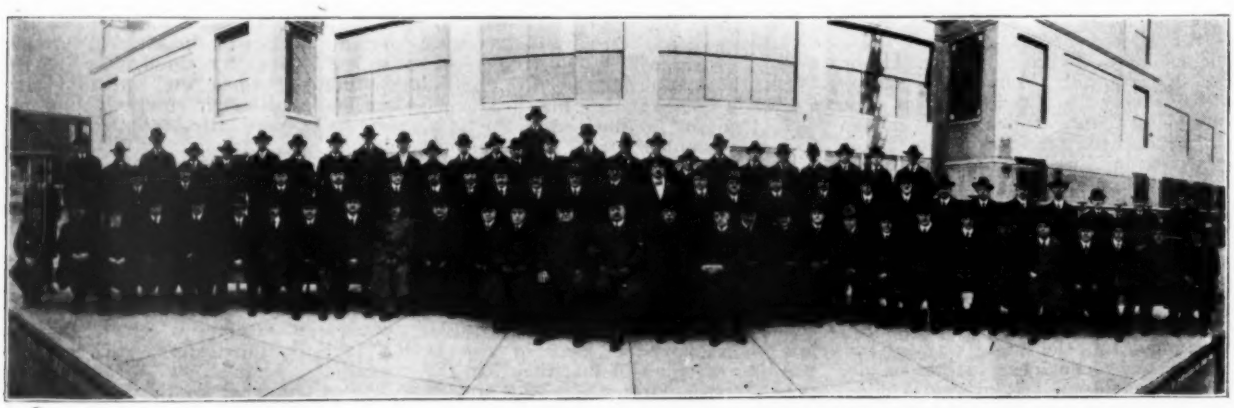
Jeffery-Dewitt Insulator Co., Huntington, W. Va., manufacturer of high grade high-tension insulators, has appointed the Baker-Joslyn Co., of San Francisco, Los Angeles and Seattle, as its sales representatives in the West. A complete stock of J-D suspension insulators and accessories will be carried at all three warehouses to adequately serve the needs of its western users.

Morse Chain Co., Ithaca, N. Y., has prepared the fourth of its series of publications "A Chain of Evidence" devoted to applications of Morse Chains for small power drives (No. 16), and deals with drives between 15 and 100 hp. It contains a detailed description of the Morse Chain and discusses its characteristics and advantages which may be summarized as follows: Positive speed ratio between driving and driven shafts, with the added feature of flexibility; 98½% to 99% sustained efficiency; quietness at high speeds; convenience of application; great reliability and long life and low upkeep cost. The bulletin is profusely illustrated with excellent views of typical installations of the Morse silent chain, which are indicative of the extensive field covered by this drive. An information card for prospective users as well as a table of data to be used in the design of Morse silent chain drives are appended.

The Electric Storage Battery Co., Philadelphia, Pa., recently concluded its five-day "Victory" sales convention, which was held at the Bellevue-Stratford Hotel in Philadelphia. The officers of the company, the sales managers from its branch offices throughout the country and the heads of departments were in attendance. Plans were discussed and formulated at all of the daily sessions to meet the increased demand for the company's batteries for commercial purposes. The company's activity in war work, consisting of the supplying of batteries in large quantities to the United States Government, to a large degree ceased with the signing of the armistice. This release from war work again places the company's factory on a peace working basis so that the battery requirements of varied industries can be promptly cared for. All of the company's products: the Chloride accumulator, the Tudor accumulator, the Exide, Hycap-Exide, Thin-Exide, and Ironclad-Exide batteries are once more available for commercial use.

A "Victory" banquet at the Germantown Cricket Club closed the convention.

Wilson Welder & Metals Co., Inc., New York, has prepared a very interesting publication entitled, "Repair of the German Ships," which records the biggest welding repair job in the history of the world. One of the most interesting facts brought out is that by plastic-arc welding approximately 288,780 gross tons of interned German ships, which had been damaged were reclaimed and repaired. This tonnage was supposed beyond repair by German crews to prevent its use by the United States for transport purposes. The damage to the vital parts of these ships was of such staggering proportions that it seemed practically useless to expect that repairs could be made inside a year and a half. However, American ingenuity and engineering ability overcame the difficulty by devising a new and better method than formerly employed, namely, Wilson plastic-arc welding and at the end of five and one-half months these ships were once more sailing the seas, effecting an economy of $20,000,000. Part of the annual report of Secretary of the Navy Daniels for the year ending Dec. 1, 1918, is included. In referring to the repair of these German ships, Secretary Daniels emphasizes the efficiency and unprecedented success of electric welding, and further states that not only was an economy of $20,000,000 effected but the transport of at least 500,000 troops to France made possible, which was of paramount importance in the prosecution of the war. Another section of this publication is devoted to an article by Capt. E. P. Jessop, U. S. N., stressing the part electric welding played in repairing damaged ships. He discusses the method of repair, speed of the work and cites as a typical instance the case of the *Vaterland*, now called the *Leviathan*, on which remarkable feats were accomplished. Some of the damage done to the machinery of the various ships is depicted and illustrations shown of the vessels in their present state. A table is included which gives the German ships repaired by the Wilson plastic-arc welder, their present American names, indicated horsepower, gross tonnage and class. A detailed description of this system of welding is offered in conclusion.



Group of Officials, Department Heads and Sales Managers at Convention of The Electric Storage Battery Co.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Athol, Mass.—An appropriation of $9500 has been approved by the Town Council to provide for street-lighting purposes during 1919.

Spencer, Mass.—In its annual budget for 1919, an appropriation of $5000 to provide for the street-lighting system during this period was approved by the borough officials.

Worcester, Mass. — Worcester Electric Light Co. has recently inaugurated a house wiring campaign, using space in the local dailies. In its announcements it is set forth that "No income is too small to afford electric light." The company points out that electric light rates are now so low and the cost of wiring so reasonable that no one can afford to be without this modern household necessity.

Providence, R. I.—Revere Rubber Co. has awarded a contract for the construction of a new transformer building at its plant. The Cruise & Smiley Construction Co., Pawtucket, is the contractor. The company recently completed plans for the construction of a new boiler house.

Alfred, N. Y.—The council is planning ways and means to secure electric lighting. Address town clerk.

Albany, N. Y.—The Public Service Commission has granted approval to the merger of the Buffalo General Electric Co. with the General Transmission Co., Buffalo.

Albion, N. Y.—Flora P. Daniels, superintendent of the New York State Western House of Refuge of Women, has made application to the State Legislature for an appropriation of $10,000, to provide for the installation of new heating lines, equipment, etc., at the institution.

Batavia, N. Y.—There is considerable talk of forming a company to furnish electric lights at Alfred. Address F. H. Ellis.

Bath, N. Y.—The board of managers of the New York State Soldiers' & Sailors' Home has petitioned the Legislature for an appropriation of $24,000 to provide for the installation of new electrical connections in the institution, and $89,200 for new heating plant, equipment, etc. S. M. Moran is superintendent.

Bay Shore, L. I., N. Y.—A large quantity of electrical equipment will be required in connection with the construction of a group of ice manufacturing buildings, including boiler and engine plant, etc., to be erected by a new company now being organized by Arthur L. Kelly and Wesler M. Oler, Jr., connected with the Knickerbocker Ice Co., New York. The proposed plant, plans for which are now in course of preparation, is estimated to cost about $100,000.

Binghamton, N. Y.—Negotiations have been completed between the Achilles Rubber & Tire Co. and the Binghamton Light, Heat & Power Co. for the furnishing of electric power to the amount of 200 hp. for the operation of the new plant of the Achilles company. It is proposed to have a daily capacity of about 300 tires and 300 inner tubes.

Brooklyn, N. Y.—Bureau of Yards and Docks, Navy Department, has taken bids for the construction of a large new stack at the boiler plant at City Park Barracks. The work is estimated to cost $15,000.

Geneseo, N. Y.—The board of trustees has had plans prepared for the installation of two new pumping units at the power plant at Conesus Lake, to be electrically operated, to provide for increased capacity. Contract for the work has been awarded to the Livingston-Niagara Power Co., which concern will make extensions in its transmission line from Lakeville to Conesus Lake.

Lockport, N. Y.—Lockport Hydraulic Race Co. has had plans prepared for extensive work at its local site, including the erection of a large hydraulic electric power plant and a number of industrial buildings, the installation of power machinery and other electrical equipment, with auxiliary apparatus. Charles E. Dickinson is president.

New York, N. Y.—Considerable new electrical equipment will be required in connection with alterations and improvements being made in the old Stewart building, Broadway and Chambers street, to be occupied by Frank A. Munsey as a printing plant.

New York, N. Y.—Fire recently damaged considerable of the stock, machinery, patterns, etc., at the plant of the Dubilier Condenser Co., 217-19 Centre street, manufacturer of condensers and other electrical apparatus.

Ogdensburg, N. Y.—The board of managers of the St. Lawrence State Hospital is planning for the installation of additional boiler equipment at the institution to increase the present capacity, to cost about $65,000, and new mechanical laundry equipment to cost $3000. Requisition will be made to the State Legislature, Albany, for appropriations for these amounts to cover the work. R. H. Hutchins is superintendent.

Richmond Hill, L. I., N. Y.—The Richmond Hill Business Men's Association has inaugurated initial steps for the formation of an independent electric light company to operate in the Richmond Hill section. A committee of six has been appointed to investigate the project, as to its feasibility, etc. At the present time service is furnished by the New York & Queens County Electric Light & Power Co.

Rochester, N. Y.—Plans are under consideration by the Rochester State Hospital for the erection of a new addition to the power plant at the institution, to cost about $72,000.

Utica, N. Y.—In connection with extensive improvements planned by the Utica State Hospital at the institution, the board of managers has made application to the State Legislature for appropriations of $10,000 for improvements in the boiler plant and engine room, and $2500 for the installation of a new electric lighting plant. H. L. Palmer is superintendent.

Bordentown, N. J.—The city has commenced the installation of new motors, electrical appliances, etc., at the municipal pumping station at Asay Springs, White Horse, to replace the present steam-operated equipment. The work is estimated to cost about $15,000. Power for operation will be supplied by the Public Service Corporation.

Dover, N. J.—New Jersey Power & Light Co. is negotiating with Louis Sacks, Inc., Newark, operating a foundry at Boonton, for supplying additional electric power for increased operations.

Harrison, N. J.—General Electric Co., Sussex street, has commenced the construction of a new addition to its power house between Bergen and Sussex streets. Salmond Brothers, 526 Elm street, Arlington, are the contractors. The company has also had plans prepared for the erection of a new building, about 94x98 ft., at its works at Ampere.

Hopewell, N. J.—The Borough Council has had plans prepared for the installation of an additional pumping unit at the municipal water works, air compressor equipment and other apparatus.

Jersey City, N. J.—Union Terminal Cold Storage Co., Montgomery street, has had plans prepared for alterations and extensions to the boiler plant at its works at 223-31 Provost street.

Keyport, N. J.—American Railways Co. has had plans prepared for the installation of new boiler equipment at its local works.

Lake Denmark, N. J.—Bureau of Yards and Docks, Navy Department, has completed plans for the installation of a new lighting system at its local site. The work is estimated to cost $50,000.

Pompton Lake, N. J.—The Borough Council has inaugurated construction

work for the proposed addition to its hydroelectric power plant.

Succasunna, N. J.—Roxbury Township Committee is arranging with the New Jersey Power & Light Co. for supplying electric energy for the operation of the electric street-lighting system of the Township, comprising Succasunna, Kenvil, and Ledgewood.

West Hoboken, N. J.—Commercial Electric Lamp Engineering Co. has filed notice of authorization to operate at 523 Angelique street, for the production of electrical specialties. John Baach, 925 Van Wagenen place, New Durham, and S. Greene, 38 Thorne street, Jersey City, head the company.

Allentown, Pa.—The city is planning for the installation of new boiler equipment in the Harrison building. Bids have recently been taken and contract awarded for electric wiring, etc., in this building, the W. H. Taylor Co., Harrisburg, being the contractor.

Chester, Pa.—Senator Eyre, of Chester, has introduced a bill in the Senate authorizing motor power companies which own the entire capital stock of any street railway to acquire the corporate powers, franchises, etc., of the railway company.

Harrisburg, Pa.—An ordinance has been introduced in the City Council providing for the removal of all poles and overhead wires of telephone companies from Front street to the eastern line in Walnut street.

Hershey, Pa.—Hershey Chocolate Co. has completed plans for the erection of the proposed new factory and power plant addition to its works. It is proposed to inaugurate construction work at an early date.

Philadelphia, Pa.—The city is arranging preliminary drafts for the leasing of the new high-speed lines, now in course of construction, to the Philadelphia Rapid Transit Co. Work on the completion of the Frankford L system is being rushed, pending the completion of the agreement.

Philadelphia, Pa.—The city is understood to be planning for extensive improvements in the police and fire alarm signal systems. In this connection requisition has been made by the Director of Public Works for an appropriation of $5,000,000, to be used for extensions and improvements in the water system.

Pittsburgh, Pa.—The city is said to be considering plans for the construction of a new crosstown traction system, to connect the southside district with Millvale.

Wilson, Pa.—Until March 14, the Board of Directors of the School District will receive bids for electrical work in connection with the proposed construction of a new school building in the South West District, and other electrical work in connection with alterations and improvements in the Fairview school building. Jordan F. Stover, 1810 Northampton street, Easton, is secretary.

Washington, D. C.—Ground has been broken by the American Ice Co., Wastong building, for the construction of a new one-story transformer building at Georgia and Uphurst avenues.

DATES AHEAD.

Minnesota Electrical Association. Annual convention, St. Paul, March 18-20. Secretary-treasurer, F. C. Hoffman, St. Paul, Minn.

Society of Industrial Engineers. National conference, New York City, March 18-21. Secretary, Irving A. Berndt, 327 South La Salle street, Chicago, Ill.

Associated Manufacturers of Electrical Supplies. Annual meeting, New York City, March 20. Secretary, Chas. E. Dustin, New York.

Wisconsin State Association of Electrical Contractors and Dealers. Annual convention, Hotel Pfister, Milwaukee, Wis., March 24-28. State secretary, John A. Piepkorn, 108 Sycamore street, Milwaukee, Wis.

Wisconsin Electrical Association. Annual meeting, Milwaukee, March 25-27. Secretary, J. P. Pulliam, 1408 First National Bank building, Milwaukee.

Tri-State Water and Light Association. Annual meeting, Greenwood, S. C., April. Secretary-treasurer, W. F. Steiglitz, Columbus, S. C.

National Fire Protection Association. Annual meeting, Ottawa, Ont., May 6-8. Secretary-treasurer, Franklin H. Wentworth, 87 Milk street, Boston, Mass.

National Electric Light Association. Annual convention, Atlantic City, N. J., May 19-23. Secretary, T. C. Martin, 33 West 39th street, New York City.

Illinois Association of Electrical Contractors and Dealers. Summer convention, Decatur, Ill., June. Secretary, N. M. Blumenthal, Chicago.

American Society of Mechanical Engineers. Spring meeting, Hotel Statler, Detroit, Mich., June 17-20. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

Ohio Electric Light Association. Annual meeting, Cedar Point, Ohio, July 15-18. Headquarters, Breakers Hotel. Secretary, D. L. Gaskill, Greenville, Ohio.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., September, 1919. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

Charleston, S. C.—General Asbestos & Rubber Co. has awarded a contract to the Fiske-Carter Construction Co., Greenville, for the erection of a new brick and concrete electric generating station at its plant, estimated to cost $60,000.

Albany, Ga.—Dermot Shemwell, Lexington, N. C., and associates, interested in the Columbia Power Co., Columbia, Ala., have acquired the Alabama Power & Manufacturing Co. It is proposed to consolidate the two corporations, the new organization to be known as the Georgia-Alabama Power Co. It is understood that plans are being formulated for the construction of a new 7500-kv-a. hydroelectric plant on Flint river, Albany. At the present time the company operates two hydroelectric plants near Columbia.

Augusta, Ga.—Site has been selected by committee of city council for the proposed municipal electric light plant. Address Mayor White.

Cordele, Ga.—The city has retained Lockwood, Greene & Co., Atlanta, Ga., engineers, to investigate the feasibility of purchasing the electric plant of the Georgia Public Service Co., for municipal operation.

Griffin, Ga.—Bell Telephone Co. will enlarge its cable plant and install equipment.

Talbotton, Ga.—Talbotton Electric Light Co., recently organized, is planning for the construction of a new local electric light plant. J. W. Jordon is interested in the company.

Rome, Ga.—The City Commission will proceed with establishment of electric light and power plant. Address mayor.

Savannah, Ga.—An electrically-driven pump will be installed at the municipal waterworks plant; contract will be awarded. Address mayor.

Tallapoosa, Ga.—Gainesboro Telephone & Telegraph Co. will improve its system, installing equipment in the exchange and placing overhead wires underground. About 10,305 ft. of cable will be installed.

Blountstown, Fla.—Election may be held upon issuance of municipal bonds for improving electric light plant and waterworks system. Address mayor.

Leesburg, Fla.—On March 12 the question of issuing $30,000 electric light bonds will be submitted to vote. Address W. H. Porter, city clerk.

Pensacola, Fla.—Pensacola Electric Co. will purchase additional equipment and make improvements. Address mayor.

NORTH CENTRAL STATES.

Bucyrus, Ohio.—Additional street lights will be placed. Address C. Vollmer of the Light Commission.

Orwell, Ohio.—The council proposes to equip a municipal light plant. It is proposed to secure a plot of ground and build a station and equip the plant in modern shape. Address town clerk.

Springfield, Ohio.—The Y. M. C. A.-Masonic Temple, seven-story building, to cost $1,000,000, will be erected this spring.

Brazil, Ind.—The city will advertise in the next few weeks for bids for the contract lighting the streets of the city for a period of years as the contract must be let during the month of April. The traction company's present contract will expire in April, 1920. Address city clerk.

Fort Wayne, Ind.—Fort Wayne Electric Equipment Co. is a new business enterprise for this city. The company will make a specialty of buying and selling Delco light products. Edwin H. Walker, Harry W. Myers and Albina Myers are the owners of the new store.

Lebanon, Ind.—Interstate Public Service Co. has been given permission to abandon its heating plant from the business section and the close-in residence section of Lebanon.

Muncie, Ind.—Nutting-Rowe Electric Co. has changed its name to the Nutting Electric Co.

Richmond, Ind.—City Engineer D. B. Davis, City Hall, will prepare plans for improving the hydroelectric works.

South Bend, Ind.—The erection of the Studebaker Theatre at a cost of $150,000, will demand a large amount of electrical equipment and installation.

Union City, Ind.—Board of Education plans a $100,000 school building to replace one recently destroyed by fire.

Bloomington, Ill.—As a guarantee that the Illinois Wesleyan University should remain in Bloomington and not be removed to Springfield, citizens of Bloomington will co-operate with the trustees in the erection of modern educational buildings on a new site which will be selected this spring.

Peru, Ill.—The Council orders lighting facilities on the steel bridge at the east end of St. Marks street. Pulaski street residents, property owners along the thoroughfare, just north of St. Marks, desire the installation of ornamental light posts there, according to a petition presented by Alderman Urban. The matter went to the committee for consideration.

Weldon, Ill.—The Town Board is considering the establishment of a $15,000 electric light system. Address town clerk.

Hibbing, Minn.—Architects Holstead & Sullivan, Duluth, have prepared plans for a $400,000 power house to be erected by the village of Hibbing. Address Charles Foster, superintendent.

Boone, Iowa.—Boone County Telephone Co. plans to expend between $25,000 and $35,000 on repairs and improvements on its lines. Installation of a new section of switchboard has been completed in the office in Boone, at an approximate cost of $10,000.

Fort Madison, Ia.—Iowa Telephone Co. will erect a two-story telephone exchange. Address J. G. Carl, manager, Davenport, Ia.

Hampton, Ia.—The city is planning to purchase electric lighting plant.

Washington, Ia.—Iowa Gas & Electric Co. expects to run a seven-mile transmission line out of Washington for rural lighting and power.

Carrolton, Mo.—A 20-year franchise was granted by the people of Carrolton at a special election, to the Water, Light & Transit Co. Work will begin first on the filtering basins of the water system. The proposed improvements will cost about $30,000.

Clarksville, Mo.—The required amount of money has been subscribed for a new electric light plant for Clarksville.

St. Louis, Mo.—A bond issue for $250,000 for new school buildings and improvements to present buildings is planned for University City, Mo., a suburban town of St. Louis.

Wichita, Kans.—Petition for a white way on First St., from Main to Lawrence avenues, has been accepted and an ordinance providing for the improvement will soon be introduced. Bids will be advertised as soon as the ordinance is passed.

Oshkosh, Neb.—Election to vote on a $45,000 bond issue for waterworks, sewers and electric lights will be called in the near future.

Plainview, Neb.—This city contemplates improvements and extensions to the electric light plant.

Gettysburg, S. Dak.—Arrangements are being made to extend wires from plant of Gettysburg Electric Light Co. to benefit the following towns: Oneida, Agar, Lebanon, Tolstoy, Seneca and Haven. $25,000 will be expended.

Hayti, S. Dak.—At a special meeting the voters authorized the issuance of bonds for the purchase of the local electric light system, which has been operated by the owner.

Sioux Falls, S. Dak.—Construction will soon be started on a 35-mile, 60,000-volt transmission line to connect the Sioux Falls division of the Northern States Power Co. with the company's transmission system in southwestern Minnesota. A portion of the line has already been completed and there is only a gap of 35 miles between Pipestone and Dell Rapids to be completed. Along with this improvement a new 3000-kw. steam turbine will be installed at the Sioux Falls power plant to care for additional business which will be secured as the result of the new line.

Bucyrus, N. Dak.—A local company will extend telephone line from Bucyrus, N. Dak., to Ellingson, S. Dak., in the spring. Address secretary, Bucyrus.

Valley City, N. Dak.—The board of control will advertise for electric lighting plants for various state institutions. Address E. G. Wanner, secretary.

SOUTH CENTRAL STATES.

Louisville, Ky.—Commercial department of the Louisville Gas & Electric Co. during the week ended Feb. 21 secured 64 customers with 32 kw. of lighting and 29 hp. in motors. New business connected to the company's lines includes 38 customers with 15 kw. of lighting and 536 hp. in motors. Electric energy output was 18.9% greater than during the corresponding period a year ago.

Mobile, Ala.—Fire, caused by the explosion of the main boiler in the power plant of the Mobile Electric Co., practically wrecked the entire boiler room at the plant. It is understood that the company will rebuild.

Jackson, Miss.—The joint conference between the city officials and representatives of the Jackson Light & Traction Co. has made sufficient progress to give assurance that substantial repairs and improvements will be made on the company's property and better service given to its patrons. It is roughly estimated that an expenditure of from $100,000 to $150,000 will be necessary to put the property in good shape.

Port Clinton, Miss.—Issuance of $25,000 of municipal electric light plant bonds was voted. Address mayor.

Mena, Ark.—The city has recently completed ararngements for the installation of a new electric street-lighting system in two principal business thoroughfares in the borough, to be of the "white way" type.

Mineral Springs, Ark.—Nashville Light Co., Nashville, has had plans prepared for the extension of its electric transmission system to Mineral Springs, a distance of about eight miles.

Texarkana, Ark.—Southwestern Gas & Electric Co. is planning for the reconstruction of its shops recently destroyed by fire. W. L. Wood, Jr., is manager.

Nashville, Ark.—Preparations are being made by the Nashville Light & Power Co. to extend its line to Mineral Springs and to furnish that town with electrical current. Work will begin on the extension soon. The distance is about eight miles.

Bristow, Okla.—The light plant is to be enlarged and new machinery installed.

Cushing, Okla.—Minnesota Electric & Power Co. is working on a plan to illuminate the business section of the town with ornamental electric lights.

Miami, Okla.—Permits have been issued for the installation of motors and other electrical equipment for the new light plant.

Muskogee, Okla.—A high tension transmission line from Muskogee to Drumwright traversing the heart of the eastern Oklahoma oil field, and touching several large towns, has been approved by the board of directors of H. M. Byllesby & Co. and construction work ordered to be begun at once. Address George Wilmarth, manager of the Muskogee Gas & Electric Co.

Shawnee, Okla.—The city is considering plans for a bond issue for $500,000, to provide for the construction of a new municipal light and power plant.

Fort Worth, Tex.—Remaining contracts for the construction of the Argon Production plant on the North Side, which will cost, it is estimated, between $4,000,000 and $6,000,000, will be awarded March 10 in Washington, D. C., by the Bureau of Yards and Docks of the Navy Department.

Palestine, Tex.—New electrical pumping machinery is to be installed in the electric plant at a cost of approximately $8000.

Wichita Falls, Tex.—Wichita Falls Electric Co. is considering extensions in its plant and system, to provide for increased capacity.

WESTERN STATES.

Kalispell, Mont.—Contract of the Mountain States Power Co. for lighting in Kalispell has been approved by the city council.

Denver, Colo.—Denver Gas & Electric Light Co. is completing the installation of a 12,500-kw. addition to its plants. It is expected this work will be completed and in operation about April 1.

Astoria, Ore.—Pacific Power & Light Co., principal offices at Port-

land, has made plans for a new steam-electric power plant on grounds adjoining its existing plant. Capacity of proposed plant is 4500 hp. This is in response to local demands created by new mill of Astoria Flouring Mill Co. and other plants.

Klamath Falls, Ore.—Consulting Engineer D. C. Henny and Geo. W. Oldfield, president of the Water Users Association, have made an appraisal of the Ankenny canal and power site from the upper lake to the Leavitt place, the purpose being to submit to the secretary of the interior a figure at which this property can be disposed of to anyone who may desire to purchase.

Seattle, Wash. — Development of Skagit River power project was discussed at considerable length in the committee of the whole council with the result that the committee of the whole recommended the passage of the bill appropriating $20,000 for development of the work and that a bill be introduced for the further appropriation of $35,000 was authorized.

Seattle, Wash.—Gray & Barasch, electrical engineers and manufacturers, are to erect a building of heavy mill construction, 34 by 93 ft., 2 stories, for a foundry for their own use.

La Grange, Cal.—The proposed Don Pedro dam to be installed four miles above LaGrange, where a reservoir and power plant are also planned by which it is hoped eventually to water 240,000 acres of irrigable land in the Modesto and Turlock irrigation districts, has advanced a step nearer an actuality. The report of A. J. Wiley, consulting engineer of Boise, Ida., was received Jan. 13. The dam, power plant and reservoir will cost in the neighborhood of $3,489,000. The dam will be 279 ft. high, not including 10 ft. of masonry to be put in the bottom of the rock bed of the Tuolumne river to act as a cut-off wall. The base will be 177 ft. The dam will be of the arch type, and the masonry will taper from a 16-ft. top. On this top there will be a roadway 1000 ft. long. The dam complete will cost approximately $2,800,000.

San Francisco, Cal.—Olmsted & Gillelen, consulting engineers, have recently been retained by the cities of Hayward and Pittsburg, near San Francisco, to prepare plans for the construction of new municipal water plants.

FOREIGN.

Kaslo, B. C.—A new hydraulic plant and 2200 feet of pipe line are being installed at the property of the Gibson Mining Co., operating about 12 miles from Kaslo, B. C. A. C. Brintnall, formerly connected with the Washington Water Power Co., is installing the plant and equipment. The property produces silver-lead and zinc ore.

Fairbanks, Alaska.—Fairbanks and Nenana will co-operate in the movement to secure a government-owned hydroelectric plant in the Tanana valley to provide power for mining and other industrial operations. The plant, if erected, will be on the Nenana.

PROPOSALS

Lighting Fixtures, Conduits, Etc.—Bids will be received until March 11, by John F. Malone, commissioner of Parks and Public Buildings, Buffalo, N. Y., for the installation of new electric wiring, conduits, lighting fixtures, etc., in connection with alterations and improvements to be made in the Stinson building, Seventh street, which will be utilized by the city as an annex to Public School No. 1.

Lighting Units.—Until March 14, bids will be received by Mrs. Annie Winsor Allen, president of the board of managers of the New York State Training School for Girls, Hudson, N. Y., for the installation of additional lighting units in cottages 5, 7 and 10, and new electric fixtures. Lewis F. Pilcher, Capitol, Albany, is state architect.

Electrical Material-Wire.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for the following: 90 storage batteries, delivery at Puget Sound, Wash. (Schedule 3752); miscellaneous electrical equipment, including switches, breakers, transformers-copper supports, to be delivered at Washington, D. C. (Schedule 3748); two switchboards complete, delivered at Puget Sound, Wash. (Schedule 3746); 2000 ft. common type, braided and leaded wire, two conductor, 10,400 c. m., delivery at Brooklyn, N. Y. (Schedule 3738); 190,000 ft. hard drawn, copper wire, for delivery at Brooklyn, N. Y. (Schedule 3771); a miscellaneous quantity of bare, nickel-chromium wire, delivered at Norfolk, Va. (Schedule 3738); and 30,000 ft. rubber-covered duplex wire to be delivered at Brooklyn, N. Y., navy yard. (Schedule 3777).

Generator.—Bids will be received until March 11 by James D. Strickland, purchasing agent, Kansas City, Kans., for a 5000-kw. generator, turbine driven, 2400-volt, 60-cycle, two-phase, at 3600 rev. temperature rise, 50 degrees centigrade, 170 lb. steam pressure. A certified check for $1000 is required. James D. Donovan, chief engineer

Turbogenerator.—Sealed bids will be received on March 10 at Willmar, Minn., for furnishing and installation of a steam engine of approximately 400 hp. and one 300-kv-a. electric generator, or one kv-a. turbogenerator unit complete, as per plans and specifications now on file with the Water and Light Commission, and at the city clerk's office in Willmar, Minn. Address Hans Gunderson, city clerk.

Fort Wayne, Ind.—Fort Wayne Electrical Equipment Co. with capital of $25,000 has been incorporated by Edwin H. Walker, Harry W. Meyers and Albina Meyers. The company will make a specialty of buying and selling Delco light products. All kinds of electrical accessories and appliances will be handled.

INCORPORATIONS

New York, N. Y.—Frederick A. Forgee, Inc. Capital, $50,000. To engage in a general electrical and civil engineering capacity. Incorporators: L. C. Burne, H. Feldman, and F. A. Forgee, 507 Fifth avenue.

New York, N. Y.—Phenix Lighting Fixture Co. Nominal capital, $5,000. To manufacture electric and gas fixtures, etc. Incorporators: M. Friedman, M. F. Schechter, and R. J. Wittstein, 916 Stebbins street.

Ridgewood, N. J.—Westrick Co. Capital, $15,000. To manufacture electrical specialties. Incorporators: M. V. Rice, J. S. Rue, and M. G. Zimmerman, Ridgewood.

Philadelphia, Pa.—Utilities Sales Corporation. Capital, $50,000. To engage in electric light, power and other utilities. Incorporators: Frank J. Reira, Wray C. Arnold, and M. Elliott, Philadelphia.

Pine Bluff, Ark.—Dixie Battery & Manufacturing Co. Capital, $12,000. To manufacture batteries, etc. Incorporators: H. A. Irish, L. C. Graham, and A. Graham.

New York, N. Y.—Underwood Contracting Corporation. Capital, $200,000. To operate a general electrical contracting establishment. Incorporators: H. T. and M. L. Underwood and H. L. Geller, 850 Kelly street.

New York, N. Y.—Whirlpool Manufacturing Co. Capital, $600,000. To manufacture boilers, engines and kindred equipment. Incorporators: A. W. Britton, S. B. Howard and Paul R. Smith, New York.

Syracuse, N. Y.—Battery Service Co. Capital, $22,444. To operate a general electric repair establishment, etc. Incorporators: A. and J. A. Hills and W. M. Wischrath, Syracuse.

Adams, N. Y.—Better Heat Service Corporation. Capital, $55,000. To manufacture boilers, furnaces and other fuel saving devices. Incorporators: C. P. Cronin, E. M. Rieth and W. S. Rice, Adams.

Point Pleasant, N. J.—Gavenite Co. Capital, $125,000. To engage in the manufacture of electrical appliances. Incorporators: John A. Hellings, R. M. Clayton and C. J. Massinger.

Utica, N. Y.—Rockford Fan Co., Inc. Capital, $100,000. To manufacture electric fans, etc. Incorporators: W. F. Bond, M. Rockford, Utica, and W. H. Clove, Rome.

Arlington, N. J.—Forest Electric Co. Capital, $15,000. To manufacture electric specialties. Incorporators: James K. Elderin, John W. Oliver, Newark, and D. T. Dobyns, East Orange.

Newark, N. J.—Earle & Parcells, Inc., 299 Central avenue. Capital, $25,000. To deal in electrical appliances, etc. Incorporators: F. H. and

M. P. Earle, East Orange, and W. W. and A. J. Parcells, Newark.

Richmond, Va.—Union Electric Co. Capital, $25,000. To manufacture electrical specialties. L. R. Warriner, president, and G. M. Miller, secretary.

Mt. Vernon, N. Y.—Robert Van Benthuysen Co. Capital, $25,000. To engage in a general electrical contracting capacity. Incorporators: E. Goodman, J. K. Field, and D. H. Barber, 288 West 92nd street.

Buffalo, N. Y.—Roche & Banas Electric Co., Inc. Capital, $25,000. To manufacture electrical goods. Incorporators: A. Banas and M. G. and D. Roche, Buffalo.

Indianapolis, Ind. — Super-Engine Manufacturing Co. Capital, $50,000. To manufacture engines, etc. Incorporators: Frank Wood, Elmer Wood and William H. Bettcher.

Moran, Ind.—Moran Electric Light & Power Co. has been incorporated with $15,000 capital to engage in the sale of electric light and power at Moran and surrounding territory. The company will purchase power from the Terre Haute, Indiana & Eastern Traction Co. N. E. White is one of the principal stockholders.

Brooklyn, N. Y.—Wearling Furnaces Co., Inc. Capital, $30,000. To manufacture furnaces, etc. Incorporators: R. Feiler, and L. and A. Miller, Brooklyn.

New York, N. Y.—Petroleum Engine & Manufacturing Co. Inc. Capital, $100,000. To manufacture engines, boilers, etc. Incorporators: W. P. Brew, M. F. Rees and W. A. Lynch, New York.

Brooklyn, N. Y.—Normanna Electrical Co., Inc. To engage in general electrical contracting operations. Incorporators: B. Hagen, and F. Werner, 322 President street.

New York, N. Y.—Harder Furnace & Engineering Corporation. Capital, $300,000. To manufacture boilers, furnaces, etc. Incorporators: W. L. Harder, M. C. Monroe, New York; and M. E. Clark, Brooklyn.

Great Neck, N. Y.—Liberty Alarm & Accessories Co. Inc. Capital, $50,000. To manufacture electrical specialties. Incorporators: F. A. Howe, W. H. Turner, and H. Rohwer, New York.

Brasher Falls, N. Y.—Milling & Lighting Co., Inc. Capital, $60,000. To operate a local electric light, heat and power plant. Incorporators: R. Hefferman, T. D. Rochford, and M. A. Hallahan, Brasher Falls.

New York, N. Y.—North American Electrical Products Corporation. Capital, $20,000. To manufacture electrical specialties. Incorporators: M. F. Riley, E. C. Schiffmacher, and J. Bernhart, 701 West One Hundred and Seventy-ninth street.

New York, N. Y.—Wald Electric Manufacturing Co., Inc. Capital, $5000. To manufacture electrical supplies. Incorporators: N. H. Bressel, D. and P. Wald, 378 East Eighth street.

New York, N. Y.—Long Acre Hardware & Electric Co., Inc. Capital, $10,000. To manufacture electrical specialties, etc. Incorporators: R. Lebowitz, H. Thal, and B. Fando, 438 West 49th street.

Alva, Okla.—Southwestern Utilities Co. operating a local electric light and power plant, has filed articles of incorporation with a capital of $500,000. Albert Manuel, New York, Percy Jones, Alva, and R. F. Rice, Lawrence, Kans., are the incorporators.

Dover, Del.—Independent Wireless Telegraph Co., Inc., has incorporated with a capital of $2,000 to construct and operate radio wireless, electric and other plants. L. B. Phillips, E. B. Thomas, Dover, incorporators.

Seattle, Wash.—Electric Appliance Co. has been incorporated with a capital of $25,000 by W. A. Marsden and S. D. Howell.

Newark, N. J.—Murray Wire Co. Capital, $125,000. To manufacture electrical wires, etc. Incorporators: J. H. Murray, Peter Igoe and J. R. Cooney, Newark.

NEW PUBLICATIONS

Electrical Goods in China and Japan.—The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued a valuable 197-page report dealing with the Far Eastern markets for American electrical goods, especially in China and Japan. This report, which was prepared by Trade Commissioner R. A. Lunquist, gives a good idea of the climate, customs of the people, conduct of trade, business methods, and many other matters having a direct or indirect bearing on the electrical goods business. Copies of "Electrical Goods in China, Japan, and Vladivostok," (Special Agents Series No. 172), can be obtained at 30 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from any district or co-operative office of the Bureau of Foreign and Domestic Commerce.

Problems of Industrial Readjustment in the United States.—National Industrial Conference Board has issued Research Report No. 15 entitled "Problems of Industrial Readjustment in the United States" which embodies a report on industrial readjustment in the United States and merely aims to define the problem and not to solve it. The problem in the United States and abroad is outlined in the introduction. The first chapter deals with readjustment as affecting labor, included in which are the demobilization of military forces; civilian war workers; demand for labor; women in industry; emigration and immigration; hours of work; wages and representation of workers. The remaining chapters discuss materials, foreign trade, capital and credit, and the relation of the Government to industry. The book of 58 pages is a clear statement of the questions involved and should tend to narrow the many differences current on the subject and to promote efforts to reach sound conclusions on these problems of grave importance.

National Board of Fire Underwriters.—A little pamphlet entitled "What is the National Board of Fire Underwriters," has been issued by this Board and sets forth in clear manner that it is an educational, engineering, statistical and public service organization, maintained by stock fire insurance companies of which nearly all the important companies are members. A brief review of the history of the Board is given and a summary of the work of its principal committees, including the actuarial bureau, the committees on construction of buildings, fire prevention and engineering standards, incendiarism and arson, public relations, etc. The organization of Underwriters Laboratories, which is maintained by the national Board is briefly described. The booklet concludes with an interesting review of the very important war service conducted by the Board's engineers for various branches of the Government during the last two years. Copies of this booklet can be obtained from the National Board of Fire Underwriters, 76 Williams street, New York City.

Government Ownership and Operation of Public Utilities.—The Special Committee on Government Ownership and Operation of Public Utilities of the Merchants' Association of New York has issued its report, reviewing the question of Government ownership and operation of public utilities, particularly with reference to new conditions arising from the war. The Merchants' Association of New York has gone on record as opposing Government ownership and operation of railroads, telephones, telegraphs, and other public utilities. It believes that such utilities are far more effectively operated under private ownership, subject to public regulation, than would be possible under governmental ownership and operation; and that it would be a national calamity to subject these instruments, indispensable to the welfare of the whole country, to the hampering, inefficient and wasteful methods inseparable from governmental undertakings. The committee in its report points out how the political selection of officials produces a personnel poorly qualified for economic service, the success of which depends very largely upon the ability and skill, the zeal and energy and soundness of judgment of the human agent employed. It further discusses the disabilities of executive officials under Government control arising from defective personnel; reasons why the financial needs of a public business undertaking are usually not promptly or sufficiently met; wasteful distribution of capital outlays; political results and dangers; what experience of Government operation shows; and Government ownership of plant and operation by contract. In conclusion, the Committee recommends that the Association endeavor, through the preparation of widespread circulation of suitable printed statements, to inform the public of the reasons why public ownership and operation is no remedy for alleged existing evils and why it is harmful to public welfare. Appendices showing the result of Government ownership of lighting plants, water plants, and other public utilities are included in the report of the Committee.

Personal

E. W. Kearns to Represent Habirshaw Electric Cable—A. W. Roche Becomes Manager Robertson Chemical—Changes

BERT HANSEN has severed his connection with the H. B. Squires Co., manufacturers' agent of San Francisco, to join the sales force of the Cutler-Hammer Manufacturing Co., Milwaukee, Wis.

JAMES H. WILKERSON, Chicago, has taken up active duties as a member of the Illinois Public Utilities Commission. He was formerly first assistant attorney-general for Illinois. He takes the position made vacant by the retirement of Fred E. Sterling, who has been elected state treasurer.

E. W. KEARNS, formerly salesman in the Chicago district for the Monarch Electric Wire & Cable Co., recently joined the Chicago sales force of the Western Electric Co. as representative of the Habirshaw Electric Cable Co., Inc., with offices at 500 South Clinton street. Mr. Kearns is well known in the electrical field in the Middle West, having been associated with the Monarch company for 16 years.

HAROLD G. PAYNE, having completed recent Government appointments, has engaged in business as an electrical engineer, specializing on problems in connection with design of power plants and systems, industrial electric power and lighting layouts, reports on utility properties, valuations and rate adjustments, management and operation. Mr. Payne has established offices at 201 Chamber of Commerce Boston Mass.

LOUIS STEINBERGER, president and general manager of the Electrose Manufacturing Co., Brooklyn, N. Y., is one of the men of the hour who "measured up" in the great struggle which was just recently brought to a close. When war against Germany was declared a call went forth, not alone for fighting men, but as well for the geniuses, the scientists, the mechanicians and all who could render assistance to the Government either across the sea or at home. It was when this need of initiative and constructive genius became acute that Mr. Steinberger tendered his valuable services and those of the great corporation he manages to the Government. He devoted his immense plant to war work and the manner in which he carried out his plans is evidenced by the electrose equipment supplied to vessels of the American navy, every vessel, from the dreadnought *Pennsylvania* to the lesser battleships, cruisers, torpedo-boat chasers, and submarines, all having been splendidly equipped with the wonderful insulation made by the Electrose Manufacturing Co. Mr. Steinberger, who was the inventor of the Electrose, has caused more than two hundred patents to be issued, with one hundred more in process of being issued relating to insulation and insulating parts. He has to his credit perhaps many more such inventions than any other inventor.

RONALD G. STARR, of Toronto, was recently appointed engineer of the Orillia, Ont., electrical and waterworks plants, succeeding the late W. K. Greenwood.

CHARLES PIEZ, president of the Link-Belt Co., Chicago, has announced his resignation as director general of the Emergency Fleet Corporation, effective May 1.

JOSEPH C. BALDWIN, JR., has been elected a director of the National Conduit & Cable Co. New York, to fill the vacancy caused by the death of Capt. J. R. de Lamar.

JOHN A. FRITZ, who has served the Scranton (Pa.) Electric Co. as chief engineer since Feb. 1, 1910, has tendered his resignation to become associated with the Penn Steel Co., Chester, Pa.

A. TURNBULL, formerly connected with the heating device department of the General Electric Co., is now representing the Edison Electric Appliance Co. in the Northwest, with headquarters at Portland.

W. H. FAIRCHILD, city engineer of Galt, Ont., has been appointed manager of the Galt Public Utilities Commission and will be in full charge of both the Hydro and Waterworks Departments.

F. C. JEANNOT has resigned from the Dayton Power & Light Co., for which he was the Wilmington district superintendent, to become superintendent at Sharon, Pa., for the Mahoning & Shenango Railway & Light Co.

WILLIS B. CLEMMITT has joined the engineering staff of the Powdered Coal Engineering & Equipment Co. of Chicago in the capacity of advisory engineer. Mr. Clemmitt was formerly assistant superintendent of the open hearth department of the Central Iron & Steel Co. at Harrisburg, Pa.

J. F. MCGUIRE, manager of the Minot, N. D., division of Northern States Power Co., has been made a member of a committee appointed by the board of directors of the Association Commerce to investigate the feasibility of building an electric line from Minot to Roseglen and Elbwoods, in which many farmers along the route are greatly interested.

A. W. ROCHE, who for the past 11 years has been connected with the Sherwin-Williams Co., specializing in insulating materials, recently resigned to become manager of the Robertson Chemical Co., Cleveland, Ohio, and will be in charge of the manufacture and sale of a complete line of insulating varnishes and compounds. The Robertson Chemical Co. is the manufacturer of insulating liquids and compounds, included in which are Armalac, Enamelac, Insullac, transformer cements, Rubberflux, etc.

K. I. DAZEY, formerly manager of collections with the Pacific Gas & Electric Co., has accepted the position of purchasing agent with the Schaw-Batcher Co., who has recently included shipbuilding in its range of industrial activity.

GEORGE H. RUPPERT, who before his entry into the chemical warfare branch of the service had charge of a sodium-ferro cyanide department of the Semet-Solvay Co., has accepted a position as advisory engineer with the Powdered Coal Engineering & Equipment Co., of Chicago.

HENRY M. BYLLESBY, president of the company bearing his name, and recently a lieutenant-colonel in the Quartermaster Corps, has been chosen president of the Chicago branch of the National Security League, succeeding Harry H. Merrick, president of the Association of Commerce. The four cardinal points in Mr. Byllesby's creed are universal military training, the weeding out of illiteracy in the United States, organized opposition to all anti-government and bolshevik activities in America, and deportation of interned alien enemies and other aliens. Mr. Byllesby was the purchasing officer for the American troops in England and the Scandinavian countries.

Obituary.

ALVA W. BERNARD, local manager of the Western Light & Power Co. at Boulder, Colo., died on Feb. 23 from pneumonia following an attack of influenza. Mr. Bernard was a very popular and highly esteemed official of this company and had a host of friends. He was born in Leadville, Colo., on July 16, 1884, and was educated in Boulder. He entered the employ of the Western Light & Power Co. in 1904 as an electrician and was rapidly promoted to various positions. In 1917 he was appointed to the position of local manager at Boulder, which office he held at the time of his death. The deceased is survived by his widow and two children.

WILLIAM A. HAINES, Detroit representative of the automotive equipment department of the Westinghouse Electric & Manufacturing Co., died suddenly on Feb. 11 from pneumonia. He had returned from a trip in the morning and feeling very ill went home at once and passed away that night. Mr. Haines was born at Minerva, Ohio, and attended the Ohio State University. In 1907 he entered the engineering department of the Westinghouse company, but later joined the sales department. Seven years later he was assigned to the Detroit office of the automobile equipment department and was made manager of this office in 1918. Mr. Haines was well known to the automotive industry, his attractive personality making firm friends wherever he went.

For the Readjustment Period—What?

XXVII.

Meeting an Emergency

The abrupt termination of the war in Europe brought the United States suddenly face to face with certain questions of grave concern to American industry.

Now, as never before, the United States must rely upon foreign trade to make certain the full employment of labor and to provide investment for capital; to stabilize industry and prevent disturbance of domestic conditions; to insure the permanent retention and operation of our new merchant vessels under the American flag; to maintain prosperity among American producers and to forestall any retrogression from the high standards that have been achieved.

The first National Foreign Trade Convention at Washington, May 27-28, 1914, recognized the need of an organization which should "endeavor to co-ordinate the foreign trade activities of t he nation," and authorized the creation of the National Foreign Trade Council for that purpose.

The Council has a membership of manufacturers, railroad and steamship men, bankers, publishers and others representing all sections of the United States, and collectively standing for the general interest of all elements engaged in foreign trade.

Non-political and non-partisan, its function is advisory, and it seeks effectively to co-operate with other organizations in the encouragement of sound national foreign trade policy.

To give constructive consideration to the needs of American foreign trade; to assist in devising means that will enable our overseas commerce effectively to meet the conditions which it faces, the National Foreign Trade Council has called the Sixth National Foreign Trade Convention, at the Congress Hotel, Chicago, on Thursday, Friday and Saturday, April 24, 25 and 26, 1919. There should be, from the power and electrical industries, as full an attendance as possible.

C. A. TUPPER CHICAGO
President INTERNATIONAL TRADE PRESS, Inc.

Financial News

Allis-Chalmers Has Its Best Year.

Business and earnings of the Allis-Chalmers Manufacturing Co. for 11 months ended Nov. 31, 1918, indicate that last year will prove to have been the largest in the company's history.

In 11 months deliveries amounted to $31,454,110, more than $5,000,000 in excess of the full 12 months of 1917, the previous record year. In the same period net profits, after generous allowance for federal taxes, were $4,996,892, almost 1,000,000 more than the full year of 1917.

The $10.00 regular and accumulated dividend required $1,650,000 and after deducting this from the $4,996,892 balance after taxes, there remained $3,346,892 for the $26,000,000 common stock, or $13.10 a share on that issue. On this basis the 12 months' earnings are estimated to have resulted in $14.63 a share for the common, after taxes, and $10 a share on the preferred.

Edison Company Reports Gain in 1918 Earnings.

The Commonwealth Edison Co. reports net earnings of $4,936,470 available for dividends in the year ended Dec. 31. This is equal to 9.79% on the stock and compares with $4,677,077, 9.28% earned in the previous year.

The balance sheet shows current assets of $11,800,000, as compared to $13,372,516 in the previous year, and current liabilities of $6,657,956, as compared to $5,165,759. A foot note explains $1,500,000 of the $1,699,441 of notes payable have been retired since the close of the year.

The company has adopted the plan of making no appropriation of earnings for excess profits taxes, but pays from surplus and tax assessed on the earnings of the previous year. Such taxes paid last year were $133,796. Provision was made in the latest income account for the income tax of 12%.

It was announced that the company has sold to a syndicate of Chicago bankers $4,000,000 of its first mortgage 5% bonds of 1908, due in 1943, and they will be offered today at 93¼, to yield about 5½%. No securities were issued during 1918.

President Samuel Insull says in his report that the company saved $1,000,000 last year by owning its own coal mines. The income account compares as follows:

	1918.	1917.
Operating revenue	$26,505,136	$25,351,585
Operating expenses	14,119,935	13,791,636
Amortization and depreciation reserve	2,822,090	2,836,246
Net operating revenue	$ 9,563,110	$ 8,723,702
Taxes and municipal compensation	2,791,368	2,229,906
Operating income	$ 6,771,742	$ 6,493,795
Other income	296,277	314,831
Total income	$ 7,068,020	$ 6,808,627
Less interest on bonds	2,131,550	2,131,550
Available for dividends	$ 4,936,470	$ 4,677,077
Dividends paid	4,033,824	3,667,352
Balance carried to surplus	$ 902,646	$ 1,009,725

ASSETS.

Plants, real estate, etc.	$ 99,275,884	$ 95,791,731
Securities	9,485,692	8,005,598
Fire insurance fund investment	983,920	.....
Service annuity fund investment	569,095	.....
Material in storerooms	1,432,614	1,730,644
Contract wiring work unbilled and advances to contractors	840,706	768,449
Coal in storage	1,240,805	770,899
Liberty loan account	793,113	549,111
Accounts and bills receivable	6,335,394	7,342,451
Cash	1,157,385	2,210,969
Totals	$122,114,613	$117,169,846

LIABILITIES.

Capital stock	$ 50,422,800	$ 50,422,826
Bonds Commonwealth Edison	34,631,000	34,631,000
Bonds Commonwealth Electric	8,000,000	8,000,000
Open accounts	53,743	243,587
Notes payable	*1,699,441	1,500,000
Accounts payable	968,922	779,155
Customers' deposits	686,736	193,911
Municipal compensation accrued	582,339	544,176
Bond interest accrued	710,516	710,516
Taxes accrued	2,010,000	1,438,000
Amortization and depreciation reserve	13,842,257	12,521,683
Fire insurance fund reserve	983,920	.....
Service annuity fund reserve	569,095	.....
Surplus	6,953,840	6,184,990
Totals	$122,114,613	$117,169,846

*Subsequent to Dec. 31, 1918, bank loans amounting to $1,500,000 (included in the above item of notes payable) have been paid off.

Central Illinois Company Re-elects Directors.

The stockholders of the Central Illinois Public Service Co. met Feb. 25 at the general offices of the company in Mattoon, Ill. All members of the board of directors were re-elected as follows: Samuel Insull, Walter S. Brewster, J. Paul Clayton, John F. Gilchrist, George W. Hamilton, Martin J. Insull and Marshall E. Sampson. Virtually all of the stock was represented at the meeting. The directors will meet soon for the election of officers.

Dividends.

San Joaquin Power & Light Co. has declared a quarterly dividend of $1.50 on preferred stock, payable March 15 to stock of record Feb. 28.

El Paso Electric Co. has declared a quarterly dividend of $2.50, payable March 15 to stock of record March 5.

Montana Power Co. has declared a quarterly dividend of 1¼%, also a quarterly dividend of 1¾% on preferred stock, botn payable April 1 to stockholders of record March 15.

Chicago Telephone Co. has declared a quarterly dividend of $2 per share, payable March 31 to stock of record March 29.

Westinghouse-Church-Kerr Co. has declared a quarterly dividend of 1¼%; also a quarterly dividend of 1½% on preferred stock, payable March 10 to stock of record Feb. 28.

A quarterly dividend of 1½% on preferred stock has been declared by directors of the Standard Gas & Electric Co., payable March 15 to stock of record Feb. 28.

The board of directors of the Rochester Railway & Light Co. has declared a quarterly dividend of 1¼% on preferred stock, payable April 1 to stock of record March 24.

New York Edison Co. has declared a quarterly dividend of 1¾%, payable March 14.

General Electric Co. has declared a quarterly dividend of $2 per share, payable April 17 to stock of record March 15.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Feb. 25.	Bid March 4.
Adirondack Electric Power of Glen Falls, common	6	11	12
Adirondack Electric Power of Glens Falls, preferred	6	72	72
American Gas & Electric of New York, common	10+extra	98	100
American Gas & Electric of New York, preferred	6	43	43
American Light & Traction of New York, common	..	240	238
American Light & Traction of New York, preferred	6	98½	98½
American Power & Light of New York, common	4	57	55
American Power & Light of New York, preferred	6	75	76
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	7	33	33
American Telephone & Telegraph of New York	..	104½	106½
American Water Works & Elec. of New York, common	..	4	4
American Water Works & Elec. of New York, particip	7	10	10
American Water Works & Elec. of New York, first preferred	..	50	55
Appalachian Power, common	..	2	2
Appalachian Power, preferred	7	12	12
Cities Service of New York, common	+extra	338	349
Cities Service of New York, preferred	6	80	79
Commonwealth Edison of Chicago	8	113	112
Comm. Power, Railway & Light of Jackson, common	..	19	19
Comm. Power, Railway & Light of Jackson, preferred	6	40	40
Federal Light & Traction of New York, common	..	9	9
Federal Light & Traction of New York, preferred	..	40	42
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	20	23
Middle West Utilities of Chicago, preferred	6	50	49
Northern States Power of Chicago, common	..	72	72
Northern States Power of Chicago, preferred	ex.div.7	90	90
Pacific Gas & Electric of San Francisco, common	..	49	49
Pacific Gas & Electric of San Francisco, preferred	6	..	..
Public Service of Northern Illinois, Chicago, common	7	89	89½
Public Service of Northern Illinois, Chicago, preferred	6	89	91
Republic Railway & Light of Youngstown, common	4	16	16
Republic Railway & Light of Youngstown, preferred	6	54	55
Standard Gas & Electric of Chicago, common	..	25	24
Standard Gas & Electric of Chicago, preferred	6	41	39½
Tennessee Railway, Light & Power of Chattanooga, common	..	2¾	4
Tennessee Railway, Light & Power of Chattanooga, preferred	6	15	16
United Light & Railways of Grand Rapids, common	4	36½	36½
United Light & Railways of Grand Rapids, preferred	6	70	70
Western Power of San Francisco, common	..	18	18
Western Union Telegraph of New York	extra	87	88¼
Industries—			
Electric Storage of Philadelphia, common	4	50	59
General Electric of Schenectady	8	154	155
Westinghouse Electric & Mfg. of Pittsburgh, common	7	43¾	43⅞
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	55	55